NETWORK WORLD

The Newsweekly of User Networking Strategies

Volume 7, Number 4 | An IDG Communications Publication | January 22, 1990

US Sprint set to unveil new bill service

By Bob Wallace
Senior Editor

FORT LAUDERDALE, Fla. — A US Sprint Communications Co. executive last week revealed that the carrier plans to introduce a billing service next month that will provide customers with a single bill for all services, as well as custom management reports and on-line access to traffic data.

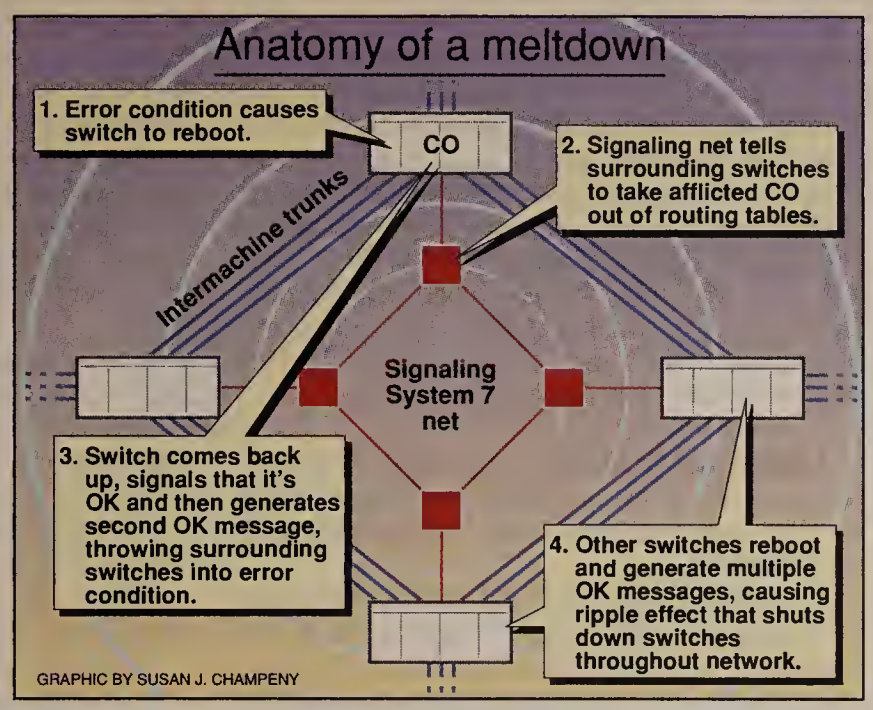
The official, speaking at the International Communications Association's 16th Annual Winter Seminar here, said the carrier will announce the Invoice Processing System (IPS) at the Communication Networks '90 conference in Washington, D.C., which will be held from Feb. 5 to 8.

"It's taken us tens of millions of dollars and over three years to develop IPS," said Richard Smith, president of the National Marketing Division at US Sprint. "We view it as the first shot fired in the billing wars."

IPS, which was praised by one early user interviewed by *Network World*, would simplify bill processing for US Sprint customers and enable the carrier to establish a unified volume discount plan covering all its services. That would give US Sprint an edge over rivals AT&T and MCI Communications Corp.

"If everything comes off as planned, IPS is going to be a great

(continued on page 62)



Novell in the '90s: Noorda, top execs discuss strategy

The 1990s will be a time of challenges for Novell, Inc. While the company currently dominates the local-area network market, it is under pressure to meet user demand for increasingly sophisticated LAN products and is facing a growing threat from the legion of OS/2 LAN Manager OEMs.

Last week, *Network World* Senior Editor Laura DiDio held a summit with Novell's leaders,

Novell details plans for global naming service, other NetWare features, page 4.

including President and Chief Executive Officer Raymond Noorda; Darrell Miller, executive vice-president of the Software Group; and Jim Bills, executive vice-president of Sales and Services.

In a recent letter, a 3Com executive purported to show how 3Com was outgrowing Novell both financially and in terms of market share. Is this true?

Noorda: 3Com *is* out 'growing' Novell. They're helping us to grow our base of NetWare users because they sell products such as Ethernet adapters that run with NetWare.

3Com is saying what it believes is true. In several areas of their business, such as the hard

(continued on page 63)

AT&T regroups after crippling net failure

Massive service outage linked to software bug that spawned chain reaction through signaling net.

By Anita Taff
Washington Bureau Chief

BEDMINSTER, N.J. — In the wake of a network failure last Monday that left AT&T unable to complete about 50% of switched calls, company officials are scrambling to shore up customer confidence.

The network glitch, which began at about 2:30 p.m. EST and lasted for nine hours, affected standard long-distance, 800, Software-Defined Network and international calls. Private-line networks were not affected.

The outage was triggered by faulty code in central office switch software AT&T recently installed in all 114 of its 4ESS switches. An error in a New York 4ESS set off a chain reaction that generated faulty code in other switches, creating networkwide havoc within 10 minutes.

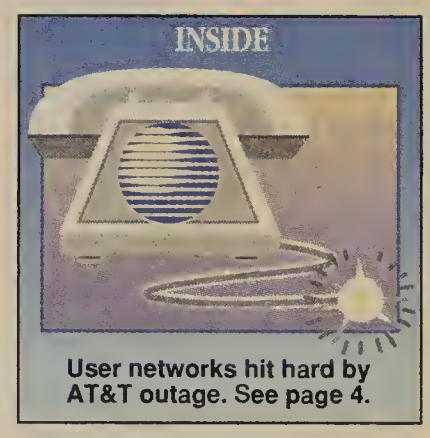
Although the full impact of the outage probably will not be known for some time, analysts, consultants and users throughout the country said the incident has shaken customer confidence. Some observers predict users will be wary of giving all of their traffic, particularly their 800 lines, to a single carrier.

The bug that caused the outage was embedded in AT&T's Generic 4E14 central office switch software, according to Jim Nelson, manager of the AT&T Network Operations Center here.

The problem began when AT&T's Switch No. 50 in New York detected an as yet unidentified error and automatically took itself off-line to reboot, a process that takes about two seconds.

In order to go off-line, the

(continued on page 4)



User networks hit hard by AT&T outage. See page 4.

Net staffers shift tack to serve users

By Wayne Eckerson
Senior Writer

You've heard it before: To succeed, companies need to integrate information technology and business strategy.

But that isn't easy, and the pundits who pitch that wisdom rarely offer network managers any practical advice on how to harness technology to achieve business goals.

The key, according to users interviewed by *Network World,* is for net managers to establish an open and permanent dialogue with the end users they serve — the people who are closest to the company's customers and business operations.

To do that, some firms have their technical staff report directly to end users instead of information systems (IS) or network executives. This immerses technical staff in day-to-day business operations and forces them to focus on solving business problems instead of technological ones.

Others send senior technical

(continued on page 60)

NETLINE

ORACLE OPTS FOR integrated circuit/packet switches for its high-speed international net. Page 2.

HP PREPS TO UNVEIL Unix-based integrated net control package. Page 2.

DEVELOPMENT TOOL helps users create NetView/PC applications. Page 2.

AMADEUS DETAILS PLANS for pan-European E-1 reservation network. Page 6.

ETHERNET TWISTED-PAIR standard gets task force approval after 2½-year development effort. Page 8.

BROADBAND NETWORKS offer hope for users with high-capacity needs. Page 41.

NEWSPAPER

FEATURE

Interoperability is in the cards for Ethernet users

By Salvatore Salamone
Features Writer

Mixing different vendors' products in a local-area network is a gamble. Randomly selecting components from different vendors can lead to interoperability problems that result in network performance degradation. To avoid that, users need a clear understanding of what interoperability means when applied to each element of a network.

LAN TEST SERIES

In the case of Ethernet adapter cards — the focus of this inaugural article in the *Network World*/Infonetics LAN Test Series — interoperability means that cards from different vendors can be mixed and matched in any combination on a single network without creating problems. For the user,

(continued on page 35)

Oracle bases global net on Netrix circuit/packet switch

Data base firm's high-speed backbone network will interconnect LANs at 100 sites using X.25.

By Paul Desmond
Senior Writer

BELMONT, Calif. — Oracle Corp. last week said it is building a high-speed international backbone network, based on integrated circuit/packet switches, that will interconnect local-area networks at 100 sites using X.25.

The 10-node backbone, anchored by $2 million worth of Netrix Corp. #1-ISS switches, will be easier to manage and less expensive to operate than the two networks Oracle now runs. The company will be able to manage the network from any one of a number of sites around the globe, shifting control according to the time of day.

Oracle opted for the Netrix switches to support diverse applications that are suited to either circuit or packet switching. The network will utilize fractional T-1 and 56K bit/sec satellite links to tie together sites on four continents.

The five-node U.S. portion of the backbone is scheduled for completion in May, and all 10 nodes should be up by the end of the year, said Gene Shklar, direc-

(continued on page 60)

HP to unveil Unix-based network control package

By Jim Brown
Senior Editor

PALO ALTO, Calif. — Hewlett-Packard Co. this week will announce a Unix-based version of its OpenView net management software that supports integrated net management functions.

HP's OpenView Network Management Server software is the first HP package capable of collecting data from disparate network devices and presenting a single system image on a workstation screen. HP's existing MS-DOS-based OpenView Windows software is a graphical interface used in building stand-alone network management systems that manage specific net devices.

The new product can also receive data from microcomputer-based net management systems that support Microsoft Corp.'s Microsoft Windows-based OpenView Windows. OpenView Network Management Server, expected to ship by mid-1990, runs on HP 9000 workstations and minicomputers under HP-UX, HP's Unix implementation.

Also this week, HP will announce its first integrated network management application, OpenView Network Node Manager. The application, which will also ship in mid-1990, will

(continued on page 58)

Application building tool boon for NetView/PC users

Vanderbeek's NAP gets high marks from users.

By Paul Desmond
Senior Writer

An IBM-blessed NetView/PC application development package is changing some users' minds about whether IBM's much-maligned NetView/PC — at least the OS/2 version — is a viable mechanism for bringing non-SNA devices under the NetView umbrella.

Users of Carl Vanderbeek & Associates' Network Management Access Program (NAP) said the software takes the pain out of developing NetView/PC applications by isolating users from the intricacies of NetView/PC's application programming interface (API). IBM began reselling NAP in November.

Users who once considered NetView/PC more trouble than it was worth are now seeing the tool in a new light.

"Had IBM provided this type of interface for NetView/PC at the very beginning, I think it might have gone a long way toward enhancing user acceptance of the product," said Frank Farbanec, a member of the technical staff at Bell Communications Research in Piscataway, N.J.

Farbanec is involved in research aimed at developing net management tools that would help the regional Bell holding companies manage their nets. One current experiment involves using NetView/PC to enable NetView to monitor and control such non-Systems Network Architecture devices as virtual circuit switches.

NAP allows users to build traps in their NetView/PC applications

(continued on page 6)

Briefs

FCC investigating Resorts deal. The Federal Communications Commission last week launched an investigation into the legality of AT&T's Tariff 15 custom network offer to Resorts International, Inc. (RCI) in Indianapolis. The deal calls for AT&T to discount its Software-Defined Network by 10% and 800 service by 8%. RCI is also eligible for volume discounts. AT&T said the offer was in response to a similar deal from MCI Communications Corp. The RCI deal will be suspended until June 21 while the FCC investigates. In an order released late last week, the FCC said it will look into several issues, including whether single-customer pricing is legal, whether prices in this deal discriminate against other users and whether MCI's offer was legal. The order addressed only the RCI deal, and it is unclear whether the FCC will suspend and investigate AT&T's third Tariff 15 deal for First Commerce Corp, based in Louisiana.

Letters of the law. The growing use of intercompany electronic communications poses many security, audit and legal issues that have yet to be fully resolved.

A two-day conference next month will gather more than 100 of the country's top experts in law, accounting, government and banking to provide users of electronic data interchange guidance on these issues.

The "EDI: Letters of the Law" seminar, which will be held Feb. 15 to 16 in Dallas, is sponsored by the Data Interchange Standards Association, the National Institute of Standards and Technology and the Accredited Standards X12 Committee on EDI. For more information about the conference, call the Data Interchange Standards Association at (703) 548-7005.

BT Tymnet reduces work force. BT Tymnet, Inc. last week said that the consolidation of its electronic-messaging businesses has forced the company to reduce its work force by 14%. BT Tymnet, which was created following British Telecommunications PLC's acquisition of McDonnell Douglas Corp.'s Network Systems Co. last November, had previously announced plans to merge its Dialcom, Inc. subsidiary and OnTyme electronic-messaging services. The company said that it cut its 1,800-person work force by about 250 employees.

SQL group, X/Open join forces. The SQL Access Group and X/Open Co., Ltd., last week announced they are working together in an effort to help users mix and match multiple vendors' SQL products on the same network.

X/Open, a consortium of international computer vendors that is developing a vendor-independent common applications environment, said it will join the SQL Access Group.

That organization comprises computer and software vendors committed to defining a specification that will enable SQL relational data bases and application development tools from multiple vendors to work together. X/Open said it plans to use the SQL Access Group technical specification for its Portability Guide definition for data management.

CONTENTS

Industry Update
Although the RBHCs are preparing to offer high-speed metro-area net services, analysts are split on the service demand. **Page 9**

Telecommunications
Although ubiquitous deployment of SS7 by the RBHCs is a long way off, the industry is already battling over access issues. **Page 11**

Data Communications
L.A. Gear details plans to build separate data and voice T-1 networks that will help reduce telecommunications costs. **Page 15**

Local Networking
While other LAN vendors charge into the new decade armed with superservers and ever more complex net operating systems, Faralon Computing is looking toward ISDN. **Page 19**

Management Strategies
What do executives want from network and computer managers? They want IS pros who can keep up with technological advances and can translate them into strategic business opportunities. **Page 23**

International Networks
An international VSAT net installed 18 months ago enables Mattel to cut nearly a month off its toy production cycle and slashed communications costs by millions. **Page 25**

Products & Services
Simware upgrades its 3270 terminal-emulation software to comply with IBM SAA's Common User Access interface. **Page 27**

Inside

Opinions	30
Letters	31
Networking Marketplace	47
Networking Careers	50

***Network World* wants you.** If you have a news tip, please contact us. We'd also like to hear about unusual network applications and how you're optimizing your networks for performance or savings. Contact Editor John Gallant at (800) 622-1108, ext. 722, or through MCI Mail at 390-4868.

Network World
161 Worcester Road
Framingham, Mass. 01701
(508) 875-6400

Second-class postage paid at Framingham, Mass., and additional mailing offices. *Network World* (USPS 735-730) is published weekly, except for a single combined issue for the last week in December and the first week in January by Network World Publishing/Inc., 161 Worcester Road, Framingham, Mass. 01701.

To apply for a free subscription, complete and sign the qualification card in this issue or write *Network World* at the address below. No subscriptions accepted without complete identification of subscriber's name, job function, company or organization. Based on information supplied, the publisher reserves the right to reject non-qualified requests. Subscriptions: 1-508-820-7444.

Non-qualified subscribers: $3.00 a copy; U.S. — $95 a year; Canada, Central & South America — $110 a year; Europe — $165 a year, all other countries — $245 a year (airmail service). Four weeks notice is required for change of address. Allow six weeks for new subscription service to begin. Please include mailing label appearing on front cover of the publication.

Network World can be purchased on 35mm microfilm through University Microfilm Int., Periodical Entry Dept., 300 Zebb Road, Ann Arbor, Mich. 48106.

Network World is distributed free of charge in the U.S. and Canada only to qualified management or professionals who specify and maintain communications equipment and systems, including voice, data and video, as well as to common carriers, consultants, systems houses and manufacturers of communications equipment.

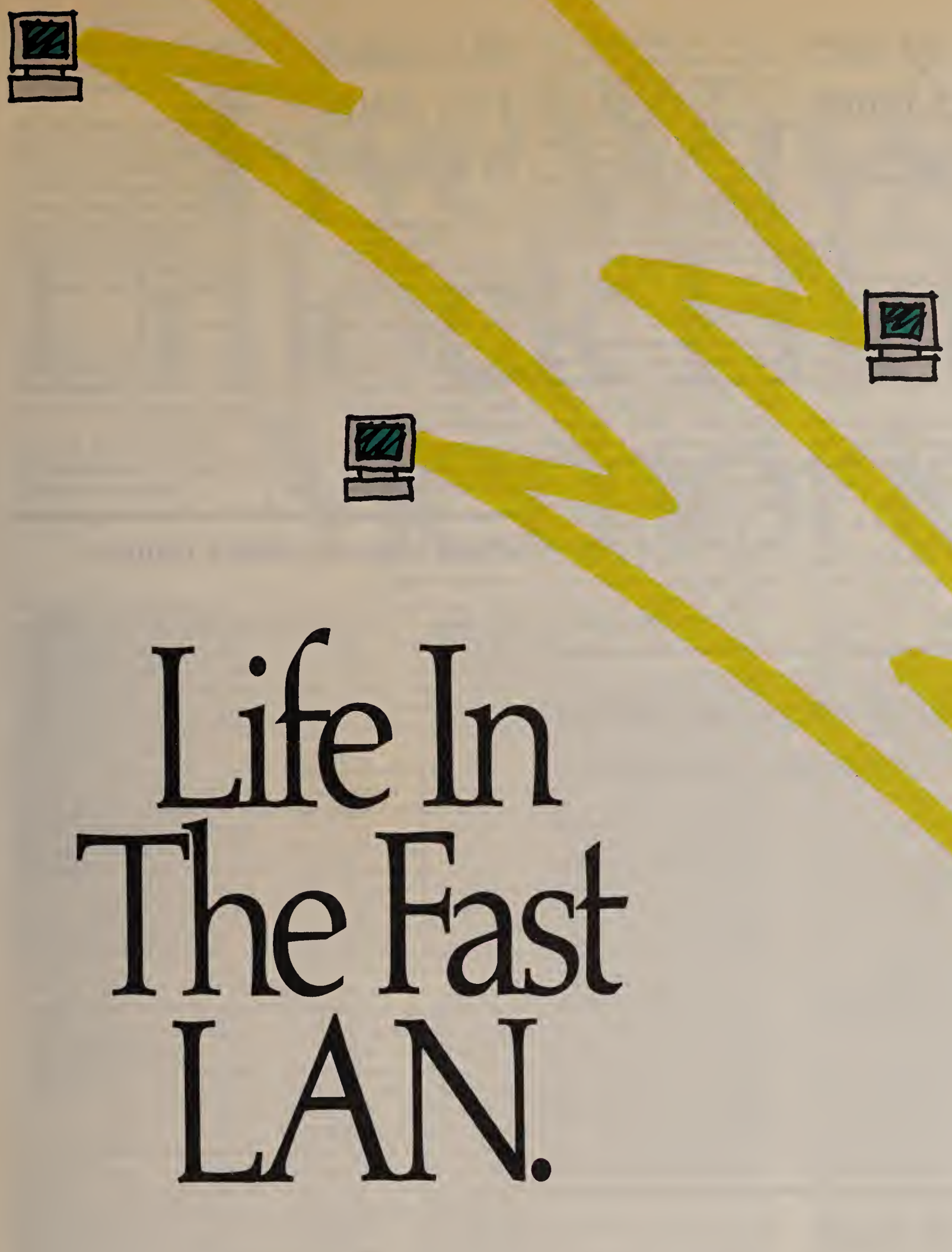
PHOTOCOPY RIGHTS: Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by Network World, Inc. for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $3.00 per copy of the article, plus 50 cents per page is paid directly to Copyright Clearance Center, 27 Congress Street, Salem, Mass. 01970.

POSTMASTER: Send Change of Address to *Network World*, 161 Worcester Road, Framingham, Mass. 01701.

Copyright 1989 by Network World, Inc. All rights reserved. Reproduction of material appearing in *Network World* is forbidden without written permission.

The Audit Bureau

Reprints (minimum 500 copies) and permission to reprint may be purchased from Donna Kirkey, Network World, Inc., 161 Worcester Road, Framingham, Mass. 01701.



Life In The Fast LAN.

Want to see how fast our LAN boards are?

Want to see it again?

We're talking about our hot new 16-bit EtherCard PLUS16™ board. A board far, far faster than any 8-bit boards. Even faster than our own blinding fast 8-bit boards. And that's fast. Because of this awesome speed, we have higher throughput than any others currently on the market. In fact, with higher throughput than any others currently in the galaxy.

With EtherCard PLUS16, your Ethernet network will suddenly become more productive. And (if you'll pardon the use of a phrase seen in virtually every computer industry ad since the introduction of ENIAC), you'll get better price-performance from your system.

Of course, we didn't just whip out our new EtherCard PLUS16 over the weekend. It's actually the latest in a long line of network hits that includes our much-heralded and top-rated 8-bit EtherCard PLUS™ and TokenCard™ boards. Boards, as you might expect, with higher throughput than run-of-the-mill competitive 8-bit boards.

But we're far from impartial. So don't just take our word on something this important.

Instead, take the word of those with no incentive to make outrageous claims. Like product reviews taken straight from the pages of trade pubs whose editors are rivaled in their honesty and purity only by Snow White.

For example, Electronic Buyers' News named EtherCard PLUS the Best Add-In Board for 1988. LAN Magazine named it the Product of the Year. And PC Digest named it winner of its highest overall rating.

Naturally, all Western Digital Ethernet and Token Ring products are compatible with Novell NetWare and work lightning fast in all IBM environments.

So if you're looking for value in network boards, look for the ones named most often by the trade pubs.

Look for the ones named Western Digital.

For the name of your nearest dealer, just give us a call at 1-800-NET-LEADER.

WESTERN DIGITAL

EtherCard PLUS, EtherCard PLUS 16, and TokenCard are trademarks of Western Digital Corporation. All other marks mentioned herein belong to other companies.

See the FAXNeT Form on Page #51

AT&T outage locks up user nets, sends workers home

Subscribers hit with nine-hour business loss might install service from other carriers to limit vulnerability.

By Bob Wallace
Senior Editor

The glitch that knocked out AT&T's switched network for about nine hours last Monday paralyzed customer networks across the nation.

Users with customer service, reservation and telemarketing operations — typically the heaviest users of 800 services — were hardest hit by what AT&T Chairman Robert Allen called "the most far-reaching service problem we've ever had."

Pan American World Airways, Inc. estimated it lost several hundred thousand dollars in business during the outage. Calling volumes at its three domestic reservation centers dropped 20% to 25%.

"It's a very scary feeling to look out at a 600- to 800-agent center and see scores of agents sitting idle because calls aren't coming in," said Al Castan, system director of communications for Pan Am.

"I sure hope AT&T has a full task force looking into the problem and coming up with ways to protect users in these situations. An outage of this nature is an extremely serious matter for Pan Am," Casten added.

Pan Am was only one of many companies hit hard by the outage.

"We got clobbered," said George Mattingly, vice-president and telecommunications director for First Union Bank, a bank holding company in Charlotte, N.C. "Our mortgage banking operation, which relies solely on AT&T's Megacom service, was knocked out for four hours.

"We had to totally close the operation down in the early evening and send employees home because the [Megacom 800] lines were out," Mattingly said.

First Union is currently migrating some of its other operations from AT&T services to US Sprint Communications Co. WATS services, so it fared better. But shortly after the mortgage unit's lines went down, upper management asked Mattingly about the problem. "I explained the situation to them and added, 'This is why we don't put all our eggs in AT&T's basket,' " he said.

The mortgage bank's Megacom lines came up during the evening, and the company was back to business as usual Tuesday morning. Mattingly said he has

(continued on page 58)

MCI stakes 25% claim in Infonet

By Bob Brown
Senior Editor

EL SEGUNDO, Calif. — MCI Communications Corp. last week said it will spend $27.5 million for a 25% stake in Infonet Services Corp., an international value-added net (VAN) operator.

Acquiring an interest in Infonet, the third-largest U.S.-based VAN operator, gives MCI a strong presence in the public packet-switching market. It also gives the carrier ties to the 10 major post, telegraph and telephone administrations in Europe and Asia that own the remaining 75% of Infonet.

Pending U.S. Justice Department approval, MCI will become Infonet's largest shareholder. MCI is purchasing its stake in Infonet from Computer Sciences Corp., a systems integration firm that is selling its remaining 5% stake in Infonet to nine of the 10 PTTs that are already shareholders.

Users will be able to order from a single source MCI and Infonet services, including electronic data interchange, electronic messaging and data center outsourcing service.

Other carriers such as AT&T, US Sprint Communications Co.

(continued on page 8)

Hurry! Time is running short for entries to ICA/NW Call for Innovation program

"I regret, in my chilled age, certain occasions and possibilities I didn't embrace."
Henry James

Don't let regret gnaw at you.

The Feb. 1 entry deadline for the International Communications Association (ICA)/*Network World* Call for Innovation is fast approaching.

Through the Call for Innovation, ICA and *Network World* honor network professionals in ICA member companies for creatively applying network technology to solve problems and create new business opportunities.

Winners of the fourth annual Call for Innovation program will have the opportunity to present their projects to ICA members at a featured session during the ICA 1990 conference set for May 20 to 25 in New Orleans. ICA will publish a journal of all qualified Call for Innovation papers, and presentations will be considered for publication in ICA's award-winning *Communique* publication.

If you're not sure whether your company is an ICA member, call ICA at (800) 422-4636. You may also contact ICA if your company is not a member but would like to join and participate in the Call for Innovation event.

For more information and entry forms, call *Network World*'s Cheryl or Tracy at (800) 622-1108.

NetWare to get global name service, other new features

By Laura DiDio
Senior Editor

PROVO, Utah — Novell, Inc. NetWare users who have been clamoring for a global naming service and remote configuration capabilities will get their wish next week, according to company executives.

Novell plans to introduce these and other NetWare enhancements — including a NetWare support for the Apple Computer, Inc. Macintosh — during a press conference at an end-user forum at the Santa Clara Convention Center in Santa Clara, Calif., next Monday.

Darrell Miller, Novell's executive vice-president in charge of the company's Software Group, said the global naming services and remote management and configuration NetWare Loadable Modules (NLM) will be available in the first half of the year and will be sold as separate software modules.

The NetWare for Macintosh NLM is expected to ship in the third quarter, he said.

NLMs are a new class of server application that are tightly integrated with the underlying NetWare network operating system but can be loaded and unloaded as needed without rebooting the server.

Global view

The NetWare global naming product has been in development since last May, when users pinpointed it as their No. 1 requirement at a NetWare developers' conference.

"We were taken aback at how emphatic they were," Miller said. "So we drafted a grand scheme that's based on international standards. We'll phase in various capabilities and functionalities over a two-year period."

The initial product release, which will enable users to log onto a network from any server and access any other server, accounts for only 20% of Novell's overall plan but accomplishes 80% of what users are currently looking for in a global naming service, Miller said.

"Our initial global naming service NLM product is very similar to Banyan [Systems, Inc.'s] VINES," Miller said. "If a particular user's access privileges allow him to access 10 network servers, he will be able to access all 10 servers simultaneously," he said.

Today, NetWare users have to

(continued on page 7)

AT&T regroups after failure

continued from page 1

4ESS sent a message out across the Common Channel Signaling System 7 (CCS7) network — a packet-switched net used to control the traffic-bearing circuit-switched network — to notify surrounding switches it was going off-line.

When the surrounding switches received the message, they reset their internal routing tables accordingly.

After rebooting, the New York 4ESS sent out a message that it was back on-line and surrounding switches began to add the node back into their routing tables.

While the switches were in the midst of resetting their routing tables, the software bug in the New York switch caused it to issue a second message across the net that it was back on-line.

The second unexpected message caused an error condition in the surrounding 4ESS switches, so they took themselves down to reboot, an AT&T spokesman said. However, once they came back on-line, the same bug caused them to issue multiple "back on-line" messages, throwing other switches into error condition.

As more and more 4ESS switches began to shut down and reroute traffic to other switches, "the thing fed on itself," Nelson said.

It was "maddening" to watch the switches shutting down and not be able to locate the problem, he said.

A host of troubleshooting ideas were discussed, including "shock therapy," which involves rebooting every switch in the country at once. But AT&T was able to continue completing some calls by shifting the signaling load to its older CCS6 network, so officials didn't want to risk any remedy that could cause a total network failure.

By the end of the day, AT&T technicians had removed the bug from the 4ESS switches by either removing the faulty code or installing Generic, an older software, Nelson said.

The challenge now is to determine the precise set of events that triggered the bug and to evaluate internal screening methods to determine why the bug wasn't caught before the software was introduced into the net, he said.

Robert Allen, chairman of AT&T, acknowledged that the network failure was a serious blow. "We didn't live up to our own standards of quality, and we didn't live up to our customers' standards of quality. That's not acceptable to our customers, and it's not acceptable to us."

Allen characterized the outage as "the most far-reaching service problem" the carrier has ever had, but he said he was sure AT&T could prevent a repeat performance. "We will do whatever it takes to correct the problem so it does not recur . . . because we know how important reliability is to our customers."

Assessing the damage

AT&T is talking to customers to determine how they were affected and whether any sort of compensation will be made, Allen said. "We have to look at each customer's condition on a case-by-case basis and determine what we can do within the constraints of our tariff, our own moral obligations and our willingness and interest in maintaining them as a long-term customer."

Allen said the company will honor provisions of its 800 Assurance Plan for customers that have it, which calls for AT&T to pay a penalty if users have problems with their 800 numbers and AT&T is unable to switch the numbers to alternate facilities.

"This condition does not fit under the 800 assurance policy, but we're going to honor it as if it did," he said.

Although Allen said AT&T will try to make amends with users, he added that the carrier has no legal responsibility to pay for business losses due to the network outage. "There is no blanket liability in a situation like this," he said.

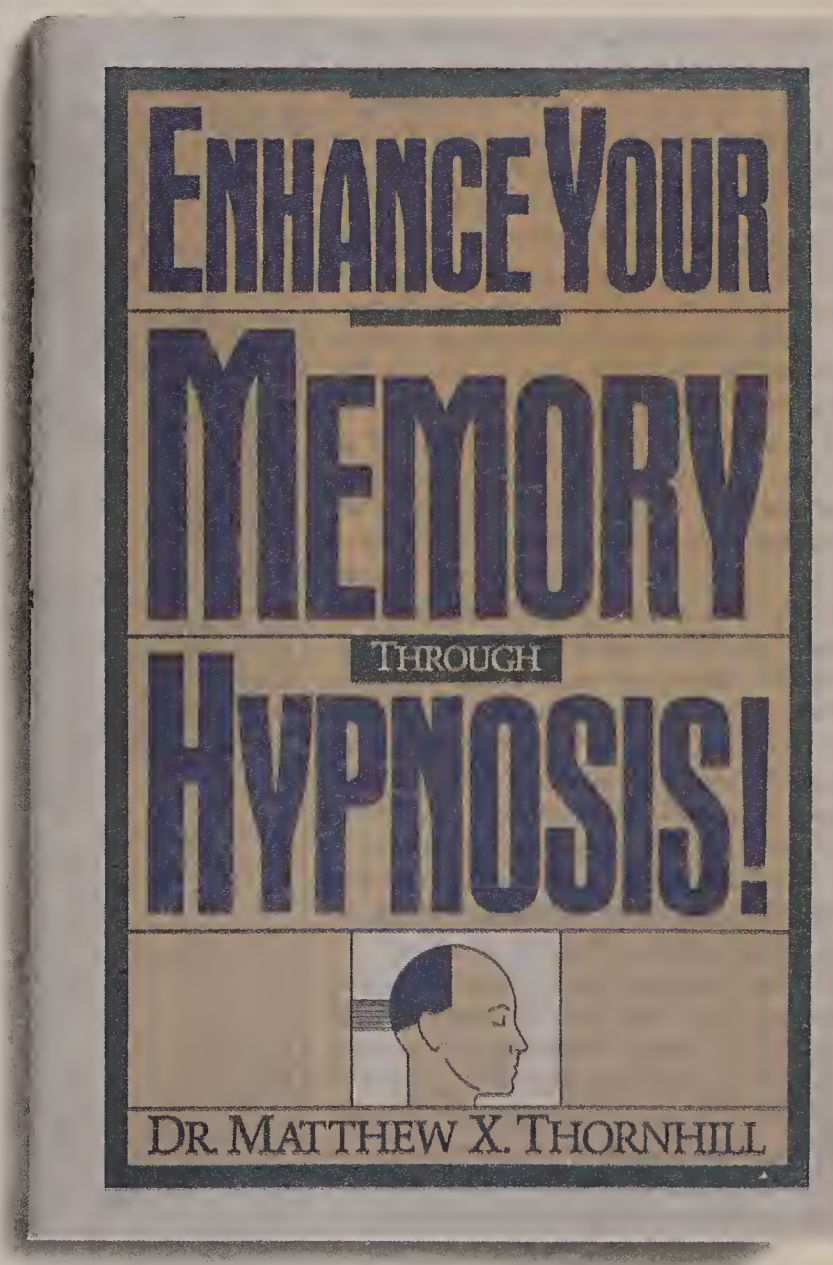
Five Ways To Unlock Hidden Memories.

1. Flexible Network Configurations.

2. Extended Memory Area (XMS).

3. Expanded Memory Window (EMS).

4. Third-Party Memory Products.



5. A Visit To Your Local Bookstore.

If your LAN operating system and applications software are gobbling up all your memory, the 10NET® Plus group of software solutions can help you get it back.

You can choose to load more or less of the operating system software to each PC on the LAN, depending on how you want each PC to function.

Or choose to load the LAN operating system in the Extended Memory Area (XMS) between 1 Megabyte and 1088K.

Or how about in an Expanded Memory Window (EMS) between 640K and 1 Megabyte.

Or maybe with Third-Party Memory Enhancement Products that provide memory between 640K and 1 Megabyte.

Remember that any 10NET Plus software solution you decide on will be NETBIOS-compatible and all come in a variety of hardware platforms including twisted pair, Ethernet and fiber optic.

10NET Plus software. There's no better way to unlock hidden memories. With one possible exception, that is.

Find out more. Call 1-800-358-1010.

DCA®

Start a file on us today. You'll need it tomorrow.

10NET and DCA are registered trademarks of Digital Communications Associates, Inc. All other brand or product names are trademarks or registered trademarks of their respective owners. ©1990 Digital Communications Associates, Inc. All rights reserved.

See the FAXNeT Form on Page #51

Amadeus details architecture of pan-European E-1 reservation net

By Barton Crockett
Senior Editor

ERDING, West Germany — Amadeus Global Travel Distribution last week gave the public its first detailed look at the architecture of its international airline reservation network, scheduled to be fully operational this summer.

The network — one of the first pan-European T-1-type networks — will be anchored by 10 channel-attached mainframes in a data center here. It will support 20 airlines as well as thousands of travel agents who will use the net to issue tickets, make reservations and check on the availability of items such as hotel rooms and rental cars. The Amadeus network is expected to handle more than 1,000 transactions per second.

Amadeus last week officially inaugurated a building for the main data center here and conducted a daylong series of press briefings detailing the net's architecture.

The net will link nine European cities using 2.048M bit/sec E-1 circuits — the European equivalent to T-1 — including this Munich suburb; London; Paris; Copenhagen, Denmark; Helsinki, Finland; Madrid, Spain; and Nice, France. John Watson, manager of network services for Amadeus, said the E-1 net should be cut over by August, the same time as the new data center.

Rather than try to break into the airline reservation business cold, Amadeus has been distributing flight, hotel and car rental reservation information since 1988 from a System One Corp. data center in Miami. Data is distributed and collected via various value-added networks (VAN) and dedicated links. One of the biggest suppliers of network services to Amadeus has been the Paris-based international VAN operator Societe Internationale de Telecommunications Aeronautiques.

Watson said travel agents will not be able to issue tickets or make reservations over the Amadeus network until the network and data center come on-line.

Most travel agents will be hooked into Amadeus via their national reservation networks, which will access Amadeus' E-1 network through dedicated links. The majority of agents will use the same terminal to access Amadeus that they use for their national reservation systems. Agents will be able to toggle between the two systems by pushing option keys. Airlines, hotels and car rental companies will access the net via dedicated links or VAN services.

Watson said Amadeus plans to run dedicated 768K bit/sec circuits over the Trans-Atlantic Telecommunications-8 (TAT-8) and Private Trans-Atlantic Telecommunications undersea fiber-optic cables into yet to be determined cities in the U.S. These circuits will be used to carry reservation information to and from major U.S. airlines, hotels and car rental agencies.

According to Watson, Amadeus will be the first company to run a large E-1 network across national boundaries on the continent. Users have shied away from building international E-1 nets because European carriers have varying and often incompatible E-1 interface standards.

Amadeus will be one of the first users of Timeplex, Inc. T-1 multiplexer interface cards that convert E-1 transmissions into a format different carriers can accommodate, according to Watson ("Reservation network group forges European T-1 net," *NW*, Aug. 14, 1989).

He said Amadeus will also be one of the first users of an innovative system configuration in which each of its 10 IBM mainframes are channel-attached and some act as front-end processors for the systems that are handling transaction processing.

"This really improves processing speed, since the mainframe is more powerful than a 3745 FEP, and reliability, since the mainframes can easily back each other up," Watson said. "It also makes it much easier to upgrade our capacity by adding more machines."

Application building tool boon for users

continued from page 2

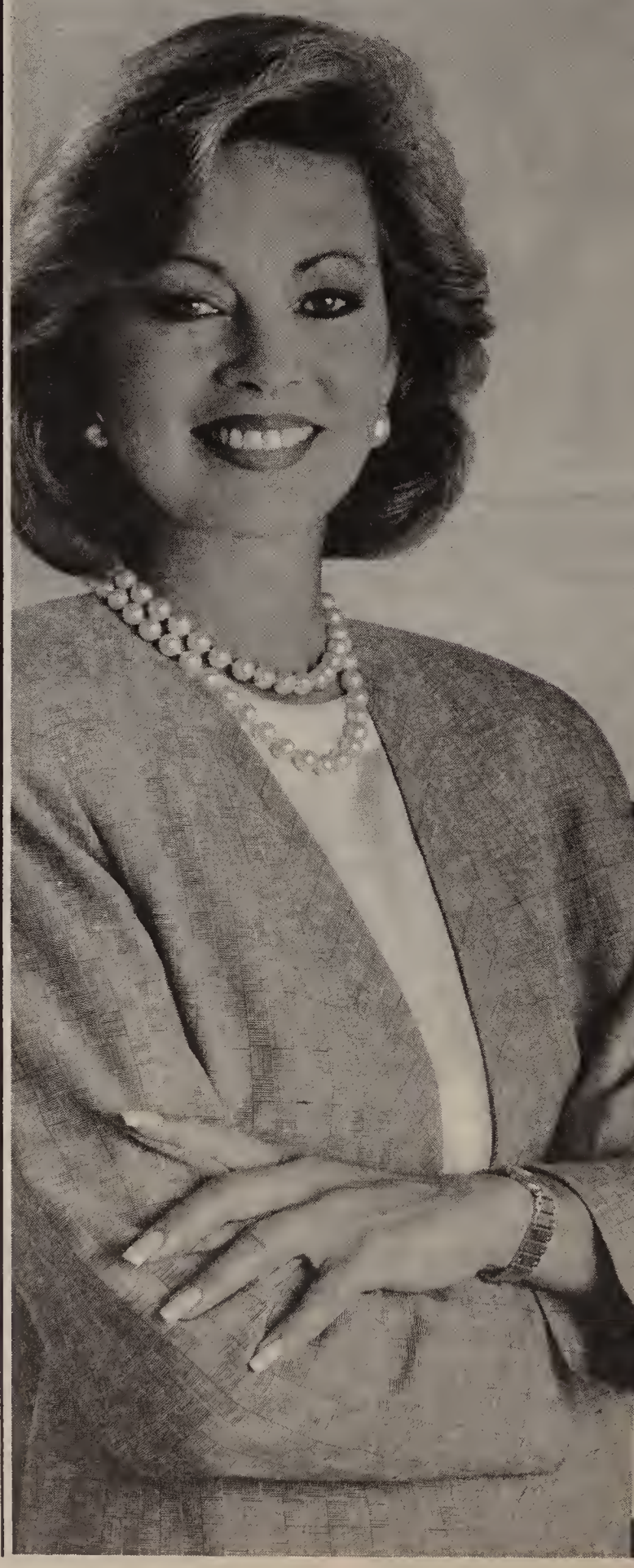
that will capture predefined portions of an alert text string coming from a non-SNA device, Farbanec said. That string can then be displayed on the NetView console, along with up to 160 characters of text detailing information such as corrective actions, he said.

Users build the traps with NAP's customization program, one of its two basic components, said Mark Vanderbeek, vice-president of Carl Vanderbeek & Associates in San Juan Capistrano, Calif. The menu-driven customization program prompts users through the process of defining the type of device connected to NetView/PC and what alarms should trigger an alert to NetView, Vanderbeek said.

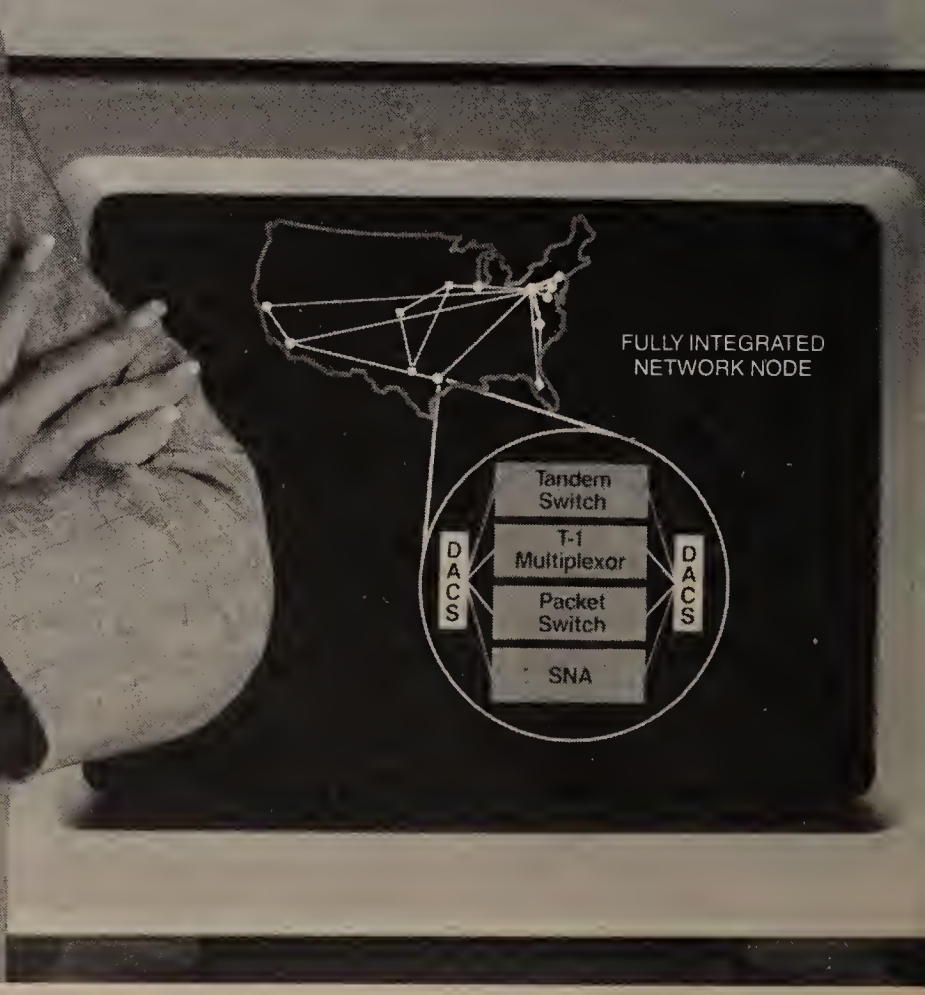
The other component, the run-time program, shields users from the NetView/PC API. Although IBM has published manuals detailing how to write applications to the NetView/PC API, users and vendors have long complained that the task requires a massive development effort. The run-time program handles that chore and provides the actual interface to NetView, Vanderbeek said.

The latest version of NetView/PC, Version 1.2, runs under OS/2 Extended Edition 1.1, which solves some of the other problems with the original DOS version of NetView/PC. Among those problems was DOS' 640K-byte memory restraint, which effectively prevented users from writing applications that monitor and control non-SNA devices from NetView.

WESTINGHOUSE COMMUNICATIONS



"They said there was no way we could get a reliable, state-of-the-art network that wouldn't need a big staff or become obsolete–at a price we could afford."



Randy Klimpl, network management specialist with the New York brokerage Goldman, Sachs & Co., recently installed NetView/PC Version 1.2 to tie the company's Network Equipment Technologies, Inc. Integrated Digital Network Exchange (IDNX) T-1 multiplexers to NetView.

Klimpl said NetView/PC Version 1.2 became a viable solution to her network management problems, thanks to the NAP development tool.

"With NAP, it's very easy to take an IDNX alert and map it to a NetView alert with some product-particular comments attached," she said. "We didn't want to undertake a major development effort [in order to use NetView/PC]."

Goldman, Sachs has had the OS/2 version of NetView/PC for only a month and is in the initial stages of developing the IDNX/NetView link. The easy part is defining what alerts should be forwarded to NetView, a process she said takes a matter of hours. Klimpl's goal is to use NetView/PC and NetView to automate a number of IDNX net management tasks. For example, if the company was forced to switch to its backup hosts, a single NetView command could be used to reconfigure the SNA network and, through NetView/PC, the IDNX net, she said.

Another user in the financial industry, the Vancouver Stock Exchange, is using NetView/PC to manage its Develcon Electronics, Ltd. DevelNet processors, which act as front ends to an IBM System/88 supporting about 150 IBM Personal System/2s located in Vancouver. The Personal System/2s are used in the exchange's fledgling automated trading program.

George Rusinski, senior telecommunications engineer for the exchange, said NAP has been a big help in developing applications that will let NetView monitor and control three DevelNet processors.

"We didn't have to know the minute details of the alerts and the way NetView handles them," Rusinski said. After working with NAP for about three weeks, Rusinski said the company has already defined all the alerts it wants to collect from the DevelNet system and is now testing NetView/PC to make sure alerts are received accurately before forging a link to NetView.

The second phase of the project is giving the NetView operator control over the DevelNet system for such commands as initiating sessions and resetting lines, Rusinski said.

NetWare to get global name service

continued from page 4

log onto individual servers separately, which is less efficient and time-consuming, Miller noted.

The remote management and configuration capabilities that will be announced with global naming will enable network administrators to configure all servers remotely from a single console, Miller said.

Remote management and configuration will also ease the task of configuring multiple servers by class or category. If administrators want to add new users to the finance group, for example, the remote configuration capability would enable them to update configuration tables on multiple servers automatically and simultaneously.

Although Novell developed the code for the global naming and remote management and configuration features from scratch, the company was able to build on the existing NetWare bindery, the data base used to store configuration tables and attributes of users and network servers, Miller said.

> "Instead of letting their fingers do the walking, users can let the X.500 Naming Conventions scout the net."
>
> ▲▲▲

"The task then became one of synchronizing all the network servers to permit automatic simultaneous logon and remote configuration," he explained.

The global naming services and remote configuration software will work with all existing NetWare products, including NetWare Version 2.1X and NetWare 386, Miller said. It costs $1,995 per company site license. "This means the user only has to purchase one copy for all his facilities," he explained.

Besides global naming services and remote management and configuration capabilities, Novell next week will introduce an NLM for Apple's Macintosh called NetWare for Macintosh.

The NLM will enable NetWare servers to support Macintosh client workstations for file and print services on a NetWare local-area network. NetWare for Macintosh is expected to be available in the third quarter for $1,995.

Down the road

Although the initial release of the global naming facility is expected to satisfy most users' needs, Novell is planning to add several sophisticated capabilities in 1991, such as digital signatures and X.500 Naming Conventions.

The digital signature capability is an advanced security feature that is already being used in the White House to verify user identities and access privileges, Miller said.

The X.500 Naming Convention standard will provide users and network administrators with a consistent method of locating various network services. "It will be similar to the Yellow Pages in the phone book," Miller said. "Instead of letting their fingers do the walking, users can let the X.500 Naming Conventions scout the network for them."

"I showed them how we could."

Now, organizations of virtually any size can have access to the most modern telecommunications technology without a major capital investment. How? With Westinghouse Network Services.

All the benefits of a custom-designed network—without the risks.

Westinghouse Network Services let you connect directly to the full capabilities of the industry's only co-located, fully-integrated voice and data network.

Network Services
- Switched voice
- Packet switching
- Bulk data transport
- SNA Networking
- Electronic Mail
- Electronic Data Interchange

This makes using these state-of-the-art network services exceptionally cost-effective. You can pick and choose from services like packet switching, SNA networking, ISDN, System Signaling 7, EDI, electronic mail, and many more—and pay only for the ones you use. You're assured of the flexibility to grow and easily reconfigure your system, at will, with virtually no capacity limit. So there's no major capital expense or risk of obsolescence. With the unique Westinghouse network management approach, you get the highest quality and reliability, too.

Westinghouse Network Services Benefits
- State-of-the-art network
- Sophisticated network management
- Network redundancy and back-up
- Flexibility to grow
- No major capital investment

The Uncommon Carrier.

Among communications companies, only Westinghouse looks at the network as a total entity. We combine network capabilities at the transport level and co-locate all switches to offer you very economical solutions to all your voice and data needs. You can select whatever capabilities you need simply by accessing the network. This gives you instant access to a powerful strategic weapon—information. To help you gain a competitive advantage.

Tell us exactly what you need. 1-800-553-1500.

Westinghouse Communications can help you create the most useful, reliable, expandable telecommunications system possible for your business. So call us, toll-free, and tell us exactly what you're looking for. We'll help you get the state-of-the-art system you need at a price you can afford.

You can be sure... if it's Westinghouse

IEEE group approves final draft of twisted-pair Ethernet standard

Action expected to speed user migration to new LAN system.

By Walter Sweet
West Coast Correspondent

SUNNYVALE, Calif. — The 10BaseT Task Force of the IEEE 802.3 Committee last week unanimously approved the final draft of the long-awaited standard for running 10M bit/sec Ethernet over unshielded twisted-pair telephone wire.

Approval of the draft, which has been under development for 2½ years, should accelerate the already rapid migration of Ethernet users from coaxial cable to telephone wire.

Ethernets on twisted pair are less expensive and easier to install, maintain and reconfigure than Ethernets based on coaxial cable.

According to Dataquest, Inc., a market research firm in San Jose, Calif., 15% of all Ethernets installed were using twisted pair by the end of 1989, despite the lack of a standard. Dataquest projects that by the end of 1993, more than 75% of all Ethernet LANs will be based on telephone wire.

The 10BaseT Task Force last week approved the draft at a meeting here. The proposal will now be sent to the IEEE's Technical Committee on Computer Communications (TCCC), which will vote on the draft at its next meeting on May 15.

If approved by the TCCC, as expected, the draft will go to the 802 Executive Committee on July 12 and then to the IEEE Standards Board for the official seal of approval on Sept. 28.

According to Pat Thaler, chairwoman of the 802.3 Committee, there are two factors to deal with when trying to come up with standards. Devising standards for products in development is difficult because the product may be outdated by the time the standards are completed.

The flip side of the coin, she said, is that it is equally difficult to develop a standard when there is already a large installed base. "You need to hit it before people get too entrenched with a solution," she said. "Hopefully, we're on the last few steps of the path to solving this."

Thaler said that all the major semiconductor companies have representatives in the 125-member 802.3 Committee, so they were able to hit the ground running in developing components for boards based on the draft standard. There have been no technical changes to the electrical specifications in the draft since the committee's meeting in the fall.

Anticipating this, Intel Corp. last week unveiled two "supercomponents" — one a chip-level product and another a standalone device — that will help people upgrade from 10Base5 coaxial cable to the draft standard. The products have been in production since last November when the draft standard was submitted to the task force in its present form. Intel said seven customers have already used the new components in prototype network interfaces. This means that boards based on the 10BaseT draft standard should be ready for users by the middle of this year.

3Com Corp., the world's largest supplier of Ethernet boards, ruffled the IEEE's feathers a bit by announcing a 10BaseT product last fall, after it became apparent there would be no more technological changes to the draft. The announcement triggered an IEEE statement that there could be no 10BaseT products at that point because there was no 10BaseT standard.

However, 3Com's gamble paid off, and it was able to start shipping the EtherLink II Twisted Pair (TP) net interface last week. The company said the product is backward-compatible with prestandard twisted-pair interfaces from SynOptics Communications, Inc., AT&T and Hewlett-Packard Co.

3Com said it has built the product so that it can accommodate variations of the standard. The company is also guaranteeing to replace the EtherLink II TP if it turns out that it doesn't comply with the final standard.

CABLETRON DELIVERS
The World's First
MANAGEABLE ETHERNET CARDS.

Cabletron's manageable Desktop Network Interface Cards have on-board transceiver chips for direct connection to twisted pair (10BASE-T), fiber optic (FOIRL), and coax (10BASE-2) LAN cabling.

These high speed DNI™ cards work in six popular platforms including IBM PC/AT, PC/XT, and PS/2, as well as Apple SE, SE/30 and Macintosh II machines.

Cabletron's DNI™ cards with Remote LANVIEW™/Windows network control management provide—

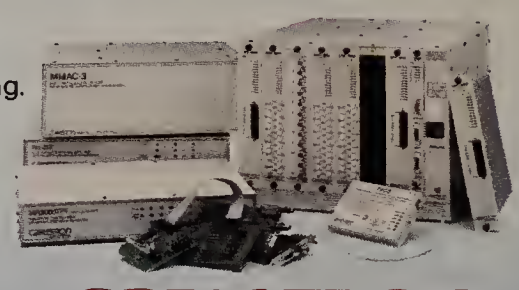
- Over the network software management.
- In-depth transmit and receive statistics including in-depth error breakout.
- Polling of cards by user name and location.
- Complete LANVIEW™ diagnostics providing network management to each user.

Cabletron Systems is a network innovator providing customers with many industry firsts—

First diagnostic indicators on network products.
First Ethernet-specific test equipment.
First software management in a ***Twisted Pair*** hub down to the port level.
First to provide integrated management for bridges and hubs. . .
. . .and now the **First** to provide PC card management. **Cabletron delivers.**

IBM PC/AT, PC/XT, and PS/2 are registered trademarks of International Business Machines Corporation.

Apple and Macintosh are registered trademarks of Apple Computer, Inc.



CABLETRON SYSTEMS Inc.
The Complete Networking Solution
A New York Stock Exchange Company

CORPORATE HEADQUARTERS
CABLETRON SYSTEMS, INC.
Cabletron Industrial Park
Rochester, NH 03867
603-332-9400

INTERNATIONAL OPERATIONS
CABLETRON SYSTEMS, LTD.
Newbury, Berkshire, UK RG13 2PZ
011-44-635-580000

See the FAXNeT Form on Page #51

MCI stakes 25% claim in Infonet

continued from page 4

and British Telecommunications PLC, are already players in the international VAN market. Last year, AT&T announced plans to acquire Istel, Ltd., a London-based VAN operator, and British Telecom agreed to acquire McDonnell Douglas Network Systems Co., including its Tymnet network. The market-leading Telenet public data network is operated by US Sprint.

Analysts applauded MCI's move. Sarah Spengler, research manager for network switching at International Data Corp., a Framingham, Mass.-based market research firm, said, "MCI will be able to exploit its relationships with the foreign PTTs to develop new international voice and data services."

Ken McGee, program director at Gartner Group, Inc., a Stamford, Conn.-based market research firm, agreed. "This will serve as a good platform on which to enter this decade of global expansion. It lets MCI go where its customers are going — overseas."

Infonet operates in more than 100 countries.

The major PTTs that share ownership of the network are based in Australia, Belgium, France, Japan, the Netherlands, Singapore, Spain, Sweden, Switzerland and West Germany.

Worth Noting

"In the past couple of years, 3Com has made more investments in the computing side than in the networking side. This general tendency is going to be reversed as we go back to the roots of the company. Fundamentally, we're a networking company."

Eric Benhamou
Executive vice-president
of product operations
3Com Corp.
Santa Clara, Calif.

People & Positions

Infotron Systems Corp., a Cherry Hill, N.J.-based network equipment maker, recently promoted **Gerard Engel** to the post of senior vice-president of marketing and U.S. sales and service.

Previously vice-president of marketing, Engel will have additional responsibilities for U.S. sales, the LAN Systems Division, field service and sales services in his new position.

Also, **Stig Persson,** formerly vice-president of engineering, was named senior vice-president of product development and engineering.

Robert McCalley, formerly director of Infotron's packet-switching products, was named vice-president of corporate marketing.

IBM named **Linda Eskind Rebrovick** branch manager for the company's new Systems Integration Division branch in Nashville, which opened early this month.

The office provides services including project management, customized programming, systems integration, and application planning and implementation for customers in Alabama, Mississippi and Tennessee.

Previously, Rebrovick served as manager for the IBM Customer Center in Nashville.

Ericsson agrees to market, service NET IDNX products

Firm to offer equipment packages with NET gear.

By Bob Brown
Senior Editor

REDWOOD CITY, Calif. — Network Equipment Technologies, Inc. (NET), based here, recently signed a remarketing and product development agreement with Ericsson Business Communications AB of Stockholm, Sweden.

The contract allows Ericsson to resell NET's Integrated Digital Network Exchange (IDNX) series multiplexers and to offer them in turnkey network packages bundled with its own MD110 private branch exchanges and Eripax X.25 packet switches.

"NET will be able to take advantage of Ericsson's presence in 80 countries."

▲▲▲

Ericsson will provide service and support for the entire package, including the IDNX network equipment and related products. NET is currently training Ericsson employees to service its wares.

NET and Ericsson have formed a committee aimed at building a higher level of integration between the two firms' product lines, said Nick Keating, NET vice-president of international.

Ericsson and NET products can already work together in a network, but Keating said improvements must be made, including tying NET products into the Ericsson network management system and vice-versa. The companies will also undertake joint Integrated Services Digital Network development.

Ericsson will provide NET with development funding and other resources to be used in integrating NET and Ericsson products.

Rolf Eriksson, vice-president at the Ericsson division, said the combination of Ericsson's and NET's offerings will be particularly attractive to users with large multinational networks.

"Ericsson will, through the agreement, be one of the leading suppliers of single-source solutions worldwide," he said.

For NET, which operates in 25 countries, the contract promises to expand its global presence. "NET will be able to take advantage of Ericsson's presence in 80 countries around the world," according to Bruce Smith, NET's

(continued on page 10)

INDUSTRY BRIEFS

Unisys Corp. recently created a systems integration and professional services group that combines elements of its commercial and government business groups.

Formation of the group is designed to help Unisys transfer its expertise in government systems integration to the commercial systems integration market. Services will include network design and facilities management.

The Systems Management Group, which becomes part of Unisys' U.S. Information Systems Division, has three units: a Services Division, a Government Systems Integration Division and a Commercial Systems Integration Division.

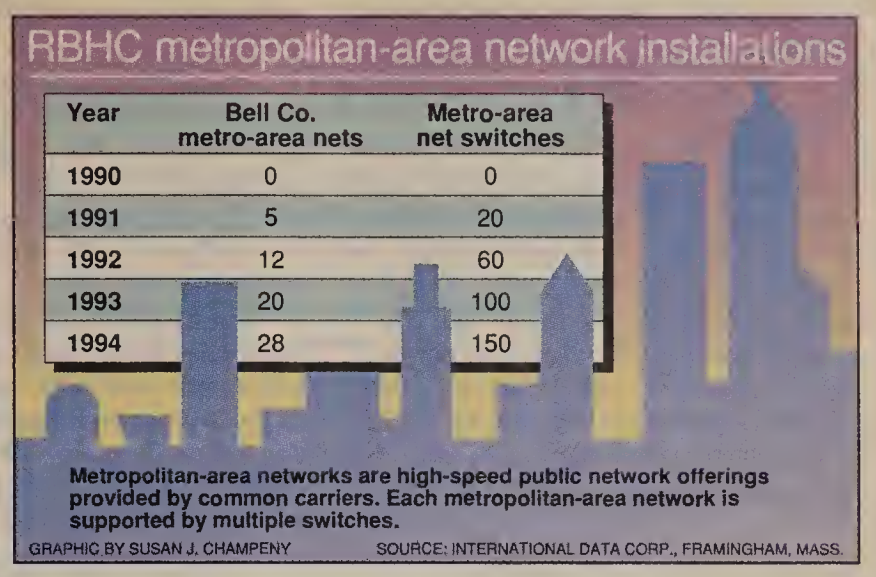
David Compert, previously vice-president of Corporate Development and Strategy at Unisys, was named president of the new group. The organization is based in McLean, Va.

More than 25 businesses, universities and trade groups have announced their participation in a new coalition formed to promote the establishment of a national high-speed information network by the U.S. government.

The **High Performance Computing Coalition**'s primary goal is to promote the authorization and funding for a National Research and Education Network to be in place by the mid-1990s. The network would improve national competitiveness and the education system, according to the coalition.

The network would be designed to link and improve existing research nets, such as the National Science Foundation Network, a coalition spokeswoman said.

Participants include AT&T, Oracle Corp. and Unisys Corp.



Outlook cloudy for metro net services

Analysts split on how successful RBHCs will be in offering high-speed switched data services.

By Gail Runnoe
Washington Correspondent

As the RBHCs prepare to offer switched metropolitan-area network services, industry analysts are split on the degree of potential demand for these services and how successful the RBHCs will be at marketing them.

The regional Bell holding companies aren't known for providing switched data services and may have trouble convincing users to shift critical data traffic onto their public networks. But the carriers may meet with success if their metro-area network services are more economical than private network arrangements.

Switched Multimegabit Data Service (SMDS) is the first metropolitan net service the RBHCs will offer, probably in the 1991 to 1992 time frame. SMDS is a switched digital data service that will enable users to interconnect multiple locations at T-1 and T-3 speeds ("Nynex service lets users link sites at T-1, T-3 speeds,' *NW,* Jan. 8).

Local-area network interconnection is the primary application the carriers are touting for their upcoming metropolitan network services.

Other potential applications include workstation-to-host and host-to-host interconnection, distributed processing, networking of computer-aided design and manufacturing systems, and medical imaging.

Some analysts raised questions about the size of the market for metro net services and question the RBHCs' ability to position themselves as data service providers.

Robert Reinhold, senior manager at Network Strategies, a network consulting practice of Ernst & Young in Fairfax, Va., said that for large users with heavy data traffic, dedicated facilities may be more cost-effective than switched metropolitan net services. Smaller companies may not have enough sites or traffic to warrant the service, he added.

In addition, users may not be comfortable handing data traffic over to the RBHC networks. James Harrison, a senior consultant at the same firm, said, "The RBHCs have never done data successfully before . . . and the importance of data traffic has increased."

Pacific Bell's Jerry Parrick

For example, Harrison said the RBHCs have had problems marketing so-called central office LAN services, which provide data switching at 56K bit/sec through the central office between devices on the user premises.

Pam Stegora, manager of product development for metropolitan-area network services at US West Communications, Inc., acknowledged that the RBHCs have to establish their reputations as data service providers. "We understand that we lack a lot of data savvy," she said.

Her company has conducted two metropolitan-area network

(continued on page 10)

Outlook cloudy for metro net services

continued from page 9

trials over the last four years "to gain some data expertise and demonstrate to our customers that we are capable of handling data," she said.

US West plans to have an SMDS-based metropolitan-area network offering available in mid-1991. "I don't think the RBHCs can afford to go out with a service that's not a premium service. [We] have to be able to guarantee reliability up front," she said.

Jerry Parrick, general manager of Pacific Bell's data communications group, said, "Nobody knows networking as well as phone companies. Competitors foster the image that we don't understand computing."

Telephone companies have gained the experience they need to handle customers' data from operating their own data networks, he said. "We are bigger in computer networking than 99% of the businesses in the U.S," he said.

Steve Kropper, program manager of International Data Corp.'s ISDN and Intelligent Networks Planning Service in Framingham, Mass., said he believes the market for metropolitan net services will be significant and the RBHCs are well positioned to profit from it.

"The market is demanding LAN-to-LAN connectivity," he said, and by 1992 — when metropolitan net services and necessary customer premises equipment should be widely available — there will be a real demand for metro net solutions.

"Most of the tremendous growth in data communications has passed by the telcos," Kropper said. "[Metropolitan networks] will be the RBHCs' first advance jump at an emerging data market."

> "I don't think the RBHCs can afford to go out with a service that's not a premium service," Stegora said.
>
> ▲▲▲

Alternative access providers, which have nibbled away a significant share of the RBHCs' market for dedicated facilities, are not likely to compete head-on with the RBHCs for switched metropolitan-area network services because they are "preoccupied with network construction and [have] limited resources," Kropper said.

US West's Pam Stegora

In order for the metro net services market to really take off, Kropper advised the RBHCs to extend the reach of their services through interconnection via long-distance carriers. "To be credible, the [metropolitan net] should connect to an interexchange carrier," he said. "Large firms that are probable [metropolitan net] customers have a national, or at least multi-LATA presence. The artificial telco service boundary does not apply to [these] businesses," he said.

"Wide-area networking is [now] available only to the privileged few — very large companies with sufficient intracorporate demand to support extensive, and expensive, worldwide networks. The [metropolitan net] offers such connectivity to smaller users, and because the facilities are shared, the cost is reduced," Kropper said.

"Except for very high bandwidth requirements, we can expect private [metropolitan nets] to disappear by 1993, as the public network comes on-line," Kropper predicted.

Ericsson to market NET IDNX products

continued from page 9

chairman and chief executive officer. NET will not resell Ericsson gear.

Currently, NET reaps about 12% of its revenues from abroad, mostly from Europe, said NET President Daniel Warmenhoven in a recent interview. "I'd like to see that double or triple," he said.

The NET/Ericsson agreement has already borne fruit. Norsk Hydro, an oil company and Ericsson customer based in Oslo, Norway, recently agreed to buy an unspecified number of NET's IDNX products through Ericsson, according to one source familiar with the agreement.

Keating said two large Scandinavian firms had agreed to buy NET products through Ericsson, but he would not reveal the names of those customers.

Michel Guite, a telecommunications analyst at the investment firm of Salomon Brothers, Inc. in New York, said the Ericsson agreement is the latest in a string of impressive alliances formed by NET. Others include its agreements with cisco Systems, Inc., IBM and Tellabs, Inc.

"Ericsson is a major factor in the European PBX market, much more so than in the U.S.," Guite said. "This deal should benefit both companies, as well as users that have multinational networks."

ATTACHMATE — Extra! SNA 3270 API, HLLAPI, SRPI

BARR SYSTEMS — HASP, SNA Remote Job Entry, SNA 3270

BLACK BOX — BSC, DIAL, SNA 3270, SNA 3770, SNA 5251

cfSOFTWARE — pcMAINFRAME

BLAST — XENIX, UNIX, DOS

CQ COMPUTER COMMUNICATIONS — CQ-327OR-4

CTI-COMMUNICATIONS — 3780FAST

CPAID — Master Tax/ Electronic Tax Filing

D3 SOFTDESIGN — Sync Tax, BSC 3780, Sync-Claim

EASTHAM & ASSOCIATES — UNISYS Basic Emulation

EMERALD TECHNOLOGIES — 3X Mate, 3X Mate UNIX

FORETELL — ESP II, EDI FACT

MICRO INFORMATION SYSTEMS — ECS Electronic Claims System

NETWORK SOFTWARE ASSOCIATES — Remotetalk, ADAPTSNA, 3270 V4, LU6.2 V4, LUO V4, RJE V4, API, HLLAPI

TECHNOLOGY DEVELOPMENT SYSTEMS — Softmail Electronic Mail

STERLING SOFTWARE — PC-TRACS 3770AF, PC-TRACS 3780

TAXWARE SYSTEMS — Tax Preparation Packages, Electronic Filing

TDT GROUP — SIX/25 3270/3770, X.25, XENIX 286/386, Transfile, PC 3780

TROPICAL COMMUNICATIONS — pcX 25

UNIVERSAL DATA SYSTEMS — BSC, DIAL, SNA 3270, SNA 3770, SNA 4251

CLEO — Datatalker 3270, SNA/SDLC, Datasync 3270, Datasync 3780, UNIX 3780

Learn Why So Many Software Suppliers Support UDS Sync-Up™ PC Modems

Outstanding software support makes Sync-Up, from Universal Data Systems, your most useful choice for micro-to-mainframe communications. For more details, send for your FREE copy of UDS' **Sync-Up Support Directory.** Contact Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35807-7002. Telephone 205/721-8000; FAX 205/721-8926.

Universal Data Systems

MOTOROLA INC.
Information Systems Group

See the FAXNeT Form on Page #51

Worth Noting

"Customers are becoming much more sophisticated than they were in the past. [Now] they're asking equipment vendors the same financial questions that [Wall Street] analysts regularly ask."

Harry Rosenthal
Vice-president
Deutsche Bank
Capital Corp.
New York

Carrier Watch

Market Dynamics, Inc., a New York-based tariff analysis firm, and **Lexicon, Inc.,** an Ann Arbor, Mich.-based consultancy, will cosponsor a conference titled "Call Aggregation — Long-Distance Marketing in the 1990s" on March 5 to 6 in Orlando, Fla.

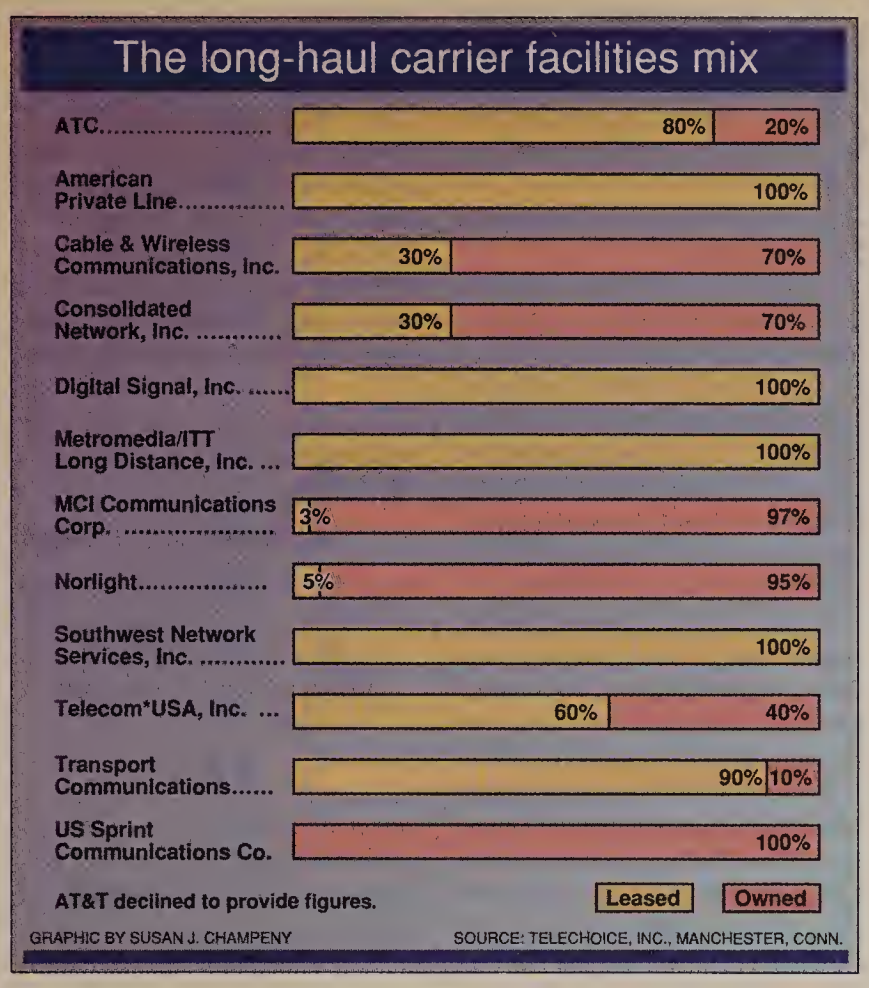
So-called aggregation deals are available from the major carriers and from non-carrier companies that act as intermediaries between carriers and groups of users that want to pool their traffic to qualify for discounts.

Aggregating traffic lets users save up to one-third on standard voice services such as WATS, 800 and virtual nets ("Users band together for service discounts," *NW,* Oct. 23, 1989).

"Telecom managers ask if they should buy from these new third-party interlopers. They ask, 'Are the large cost savings that aggregators and third-party rebillers promise real?,' " said Robert Self, Market Dynamics founder and author of *Long Distance For Less. The Official Guide to Long-Distance Telephone Services in the U.S.*

Self will present about half the program, while other industry experts will use the rest of the time to discuss how to buy from aggregators.

The conference costs $575 per attendee. It will be held at the Sheraton World in Orlando. For more information, call (800) 678-0398.



Advent of AT&T SDDN will enhance data capabilities

Virtual data service will be offered as SDN option.

By Daniel Briere
Contributing Editor

AT&T has made great strides in the past year toward enhancing its Software-Defined Network (SDN) service to support high-speed data communications.

Although the company already offers a switched 56K bit/sec option to SDN customers, it has to support the service over a subnetwork because its switched network is not fully digital.

ANALYSIS

By the end of the year, however, AT&T plans to introduce its Software-Defined Data Network (SDDN), a move that will open up SDN to the data world and lure customers away from dedicated private lines.

AT&T originally introduced a switched 56K bit/sec data transmission service as a stand-alone product, called Accunet Switched 56, in 1985. The service encountered only limited success, largely because of its high cost (up to 85 cents per minute) and limited availability.

In 1988, AT&T sought to bolster both Accunet Switched 56 and SDN by linking the two and allowing SDN users to transmit data at 56K bit/sec. However, SDN customers were still faced with the same constraints that regular Accunet Switched 56 users have — high costs and limited availability. In 1989, AT&T slashed the cost of using SDN to access Accunet Switched 56 to bring it more in line with the competition, which was offering switched data transmission at voice rates.

Briere is president of TeleChoice, Inc., an industry consulting firm located in Manchester, Conn.

Static vs. dynamic

AT&T's switched 56K bit/sec capability, marketed under the feature called Digital Routing, is offered in two forms: static and dynamic. In the static mode, users need full-time access to the network at 56K bit/sec and the usage charges are the same as Accunet Switched 56.

In the dynamic mode, the customer may initiate 56K bit/sec calls on a call-by-call basis using a special feature code. This code tells the network that a switched 56K bit/sec call should be routed to the Accunet Switched 56 network. In the dynamic mode, 56K bit/sec calls are charged at Accunet Switched 56 rates, while

(continued on page 13)

> By the end of the year, AT&T plans to introduce its Software-Defined Data Network.
>
> ▲▲▲

RBHC tariff for SS7 raises new questions

Regulators, telcos and users already embroiled in access and interconnection issues for new net.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Although ubiquitous deployment of Signaling System 7 (SS7) by the regional Bell holding companies is a long way off, the industry is already battling over the way in which users and vendors will be allowed to access these networks.

Late last year, Ameritech became the first local carrier to file a tariff that outlines prices, terms and conditions under which users and carriers can access its SS7 network to support new applications.

The tariff, however, has been held up at the Federal Communications Commission by protests from several long-distance carriers and the Ad Hoc Telecommunications Users Group.

Opponents claim Ameritech's access arrangement is too restrictive for them to realize the full potential of the out-of-band SS7 technology and say that the pricing structure Ameritech is proposing will result in inflated rates.

There is also a danger, they say, that the Ameritech tariff could set a precedent for other carriers.

If every carrier is allowed to proceed independently with different proposals, huge variations in pricing and technical capabilities could result.

The Ameritech proposal "is the leading edge on the tip of the iceberg and if you don't kill it now, it'll propagate itself," said Frank Dzubeck, president of Communications Network Architects, Inc., a consulting firm in Washington, D.C.

The FCC is expected to make a decision on Ameritech's tariff this week.

First steps

The two initial services to be offered by Ameritech — access to the carrier's credit card validation data base and SS7 for customers leasing Feature Group D trunk ports on central office switches — will appeal primarily to carriers but may be attractive to users as well.

For example, large public facilities such as hotels, convention centers, airports or stadiums, could use the credit card data base service to perform their own vali-

(continued on page 12)

WASHINGTON UPDATE

BY ANITA TAFF

AT&T gets go-ahead on Tariff 16 plan. AT&T received permission from the Federal Communications Commission last week to proceed with its Tariff 16 custom network plan for the U.S. Army Personnel Department in St. Louis.

The deal provides 800 service to the government at rates discounted below either standard 800 or Megacom 800 service. AT&T has guaranteed not to raise prices during the three-year term of the contract. The network deal was protested by US Sprint Communications Co., which claimed that even though the government can qualify for special rates, the deal in St. Louis was illegal because it was limited to a single department. US Sprint also complained that there is no apparent reason why a custom deal was required since the personnel department did not appear to have any unique telecommunications needs.

FCC deems Nynex rates justifiable. The Federal Communications Commission has dismissed a complaint filed by MCI Communications Corp. against Nynex Corp. in which MCI had said Nynex's rates for interstate access for high-capacity lines were too high. In filings at the FCC, Nynex said its rates were set to earn 59.7% from October 1985 through October 1987. MCI argued that these levels were too high because in other cases, the FCC had ruled that high-capacity rates earning over 40% were illegal. The FCC said that even though Nynex's rates were strategically priced to recover more than the cost of providing service, the rates could be justified. FCC policy at the time said, in some circumstances, strategic pricing was legal.

Octel introduces high-end voice-messaging systems

By Bob Wallace
Senior Editor

MILPITAS, Calif. — Octel Communications Corp. recently announced a high-end voice mail system for users in campus-style environments and a system for telephone companies to use in offering voice mail services.

The basic building block for both systems is a 72-port voice-messaging system that can be networked using a 100M bit/sec Fiber Distributed Data Interface (FDDI) network to create larger systems.

The Maxum SuperSystem is available as a 144-port or a 216-port system that can support 30,000 subscribers and store up to 912 hours of voice messages. The central office-based Sierra unit can be purchased in 72-port increments up to 2,304 ports.

Octel said the Maxum SuperSystem will not be available until early next year and would not divulge pricing for either system. The company said that the fiber-optic interface cards used to link the components will cost less than $20,000 for each unit.

The Maxum SuperSystem can support 30,000 subscribers and store 912 hours of voice messages.

▲▲▲

A Sierra with 2,304 ports, called a Super Platform, can support 500,000 subscribers and store up to 10,752 hours of messages. It can serve as many as 144 central offices linked via analog or digital private lines.

The Sierra's architecture features separate voice processing and data processing modules, unlike traditional voice processing systems, which rely on a single master processor to perform all system tasks, the vendor said. This lets the system support far more subscribers than current systems.

The voice module uses as many as 18 Intel Corp. 80386 microprocessors in each 144-port platform, depending on the number and type of applications supported.

Data module

The data module, which is used to handle billing and administrative tasks, is based on a single Intel 80386 processor using a Unix operating system. Sierra can connect to external computers via an X.25 communications link to support data processing applications such as electronic mail and interactive voice response.

Octel said a 72-port single-frame Sierra platform can be ordered immediately. The vendor plans to ship the 144-port platform in the third quarter of 1990.

Octel sells its voice processing systems through major U.S. and European distributors and direct sales offices in 14 cities. The company has an OEM agreement with Hewlett-Packard Co., which distributes Octel's sytems in Europe.

For more information, contact Octel at 890 Tasman Drive, Milpitas, Calif. 95035, or call (408) 942-6500.

Tariff for SS7 raises questions

continued from page 11

dation for calling card calls, Dzubeck said.

Customers pay a surcharge on calling card calls. If hotels and other companies perform the validation themselves, they — rather than an outside operator service — can receive the fee.

"Users don't need operator services; those guys are milking everybody," Dzubeck said. Most users' PBXs would be capable of performing the validation if they had access to the data base, he said.

"Users don't need operator services; those guys are milking everybody," he said.

▲▲▲

According to Page Montgomery, a principal at Economics and Technology, Inc., a consulting firm in Boston, "Access to RBHC data bases would be important for virtually any type of on-line transaction processing or telemarketing application. There may be more potential end-user applications than carrier applications" for SS7, he said.

Dzubeck and Montgomery said that end users within Ameritech's region could use the SS7 option to identify the telephone number of customers calling from local telephones.

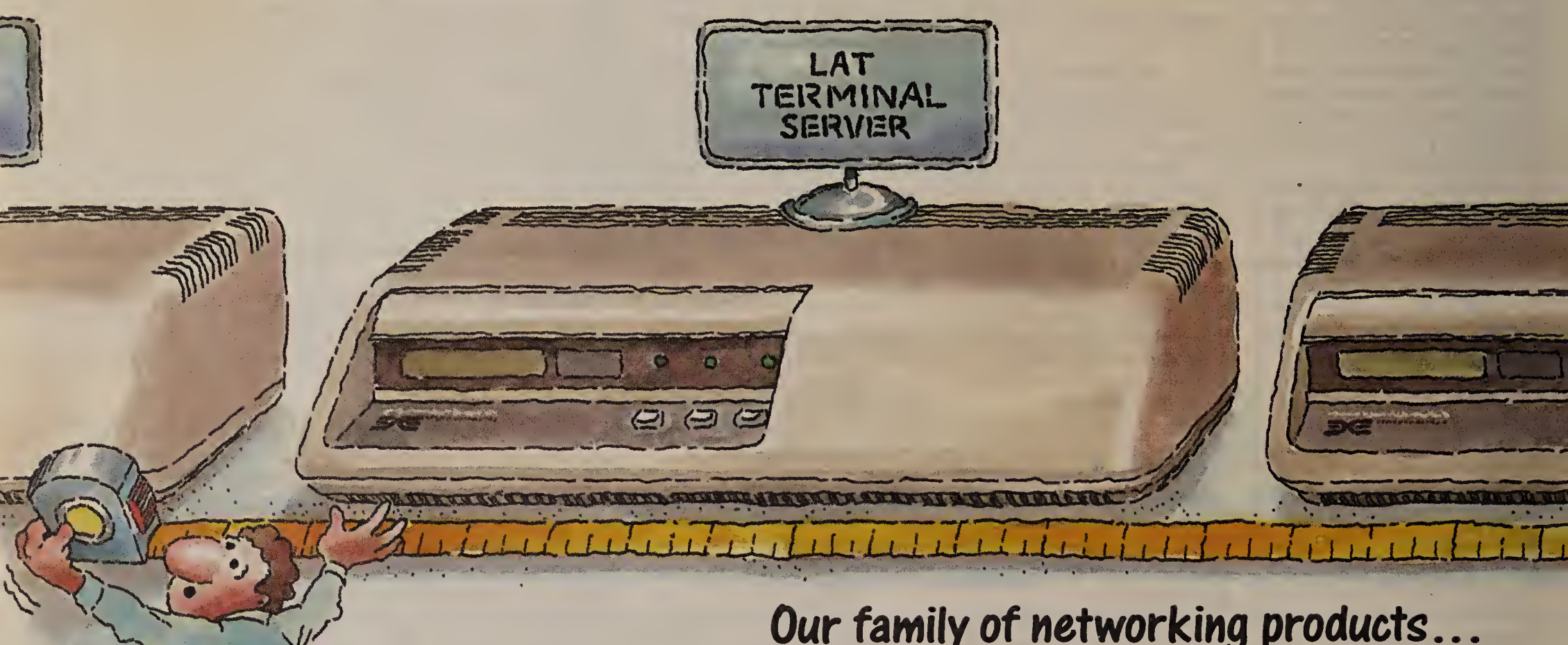
Caller identification service is not currently available from Ameritech. The only way a company can identify callers today is to use an 800 or 900 number from a long-distance carrier.

Accessing SS7

Ameritech's tariff proposes allowing customers to access the SS7 network through Signal Transfer Points (STP) — packet switches that translate and route signaling messages — via Dedicated Network Access Links, 56K bit/sec channels within T-1s.

The STP service will be offered initially only in Chicago, although Ameritech plans to add STPs in Michigan and Ohio. Monthly charges for users will be $1,075 per STP port with a $70 nonrecurring charge.

Because the SS7 services will utilize some existing facilities, opponents raised questions about Ameritech's proposed rates for SS7 access. MCI Communications



Our family of networking products...

Emulex has made a *total commitment* to providing networking solutions. Consider our available options:

When you need to connect up to 32 DEC terminals, our Performance 4000 Ethernet Terminal Server is the perfect fit. (For smaller networking requirements, we also offer an 8-port model, the Performance 4008!) Both provide LAT protocol compatibility and have more features than the DECserver 200.

And when your networking needs require TCP/IP compatibility, the Performance 4000T Terminal Server is the answer. Like the P4000, it's fast. It features simultaneous throughput rates of 19.2Kbps for 32 lines, and 38.4Kbps for 16 lines. (The Performance 4008T offers

North American Offices: Anaheim, CA (714) 385-1685; Dublin, CA (415) 829-1170; Roswell, GA (404) 587-3610; Burlington, MA (617) 229-8880; St. Louis, MO (314) 569-7792; Saddle Brook, NJ (201) 368-9400; Reston, VA (703) 264-0670; Schaumburg, IL (312) 605-0888; Canada (416) 673-1211

Corp. and US Sprint Communications Co. asked whether some of the costs of providing SS7 access are already being covered in existing tariffs.

Dzubeck also took issue with the flat rate structure. He contends that access services should be charged on a usage basis to prevent companies from paying for services they aren't using during slow periods.

But opponents say their worries extend beyond Ameritech's specific pricing scheme. They are concerned that if each carrier is allowed to proceed independently through the tariff process, huge variations in pricing and technical capabilities may arise.

"There seems to be a great tendency among the [RBHCs] not to adopt a single approach to things," Montgomery said. A lack of uniformity among various RBHCs' SS7 access plans would be a particularly acute problem for larger corporations that often operate in multiple states and for applications such as ANI, which are national in scope.

It may also create problems when the RBHCs try to devise a way to interconnect their disparate SS7 networks, Montgomery said. "People are finding out you can have 80% in common with somebody else, [but] the 20% of things that aren't quite common make all the difference."

As an example, he pointed to incompatibility of different vendors' Integrated Services Digital Network equipment. Even though all of the products were designed to the same standard, differences make them incompatible.

Richard Levine, telecommunications consultant at Touche Ross & Co., agreed that there could be problems if the RBHCs don't adopt a single appproach for interconnecting SS7 networks but expressed optimism that the industry would evolve toward uniformity.

> "There is a tendency of the RBHCs not to adopt a single approach to things."
>
> ▲▲▲

"Right now, all of the federal tariffs for all of the feature groups are relatively in conformity from a technical perspective. I assume, after some trial and error, that a method of delivery for Signaling System 7 will work itself out," Levine said.

SDDN to enhance data capabilities

continued from page 11

all other calls are charged according to SDN schedules.

One drawback is that Digital Routing is available only at the more than 250 SDN offices specifically set up for the capability. SDN customers, for example, cannot terminate SDN Digital Routing calls at Accunet Switched 56 customer sites. AT&T plans to expand Digital Routing to enable users to terminate switched 56K bit/sec calls off-net.

When SDDN arrives, it will be an option of SDN, rather than a stand-alone product. AT&T said it hopes that its sales personnel will be able to use SDDN to win SDN accounts.

SDDN will offer switched digital 56K and 64K bit/sec clear-channel virtual connections. Access will be through Integrated Services Digital Network Primary Rate Interface (PRI) links, and the initial release of SDDN will require a special PRI premises device that provides ongoing signaling with the network.

Critical to any data networking product is instantaneous restoration of downed or damaged circuits. AT&T will be relying on its PRI premises device to coordinate restoration on an end-to-end basis.

Besides providing clear-channel 56K and 64K bit/sec channels, SDDN will enable users to establish higher bandwidth connections by dialing up multiple connections. For instance, if customers wanted 384K bit/sec of bandwidth for an application such as videoconferencing, they could establish six dial-up links. Although it would not be a contiguous 384K bit/sec link, it would probably do the job.

SDDN vs. Switched 56

Although SDDN will appear similar to AT&T's Accunet Switched 56 service, the services will actually be quite different.

First, there are no performance guarantees with Accunet Switched 56. With SDDN, there will be a service objective of restoration within 20 seconds upon failure.

Second, SDDN uses PRI access. Messaging between PRI premises devices and the network makes the restoration promise possible. A break in the circuit causes the premises PRI device to reestablish the circuit. Over the enhanced SDDN backbone, the network will be able to route the call and complete another connection.

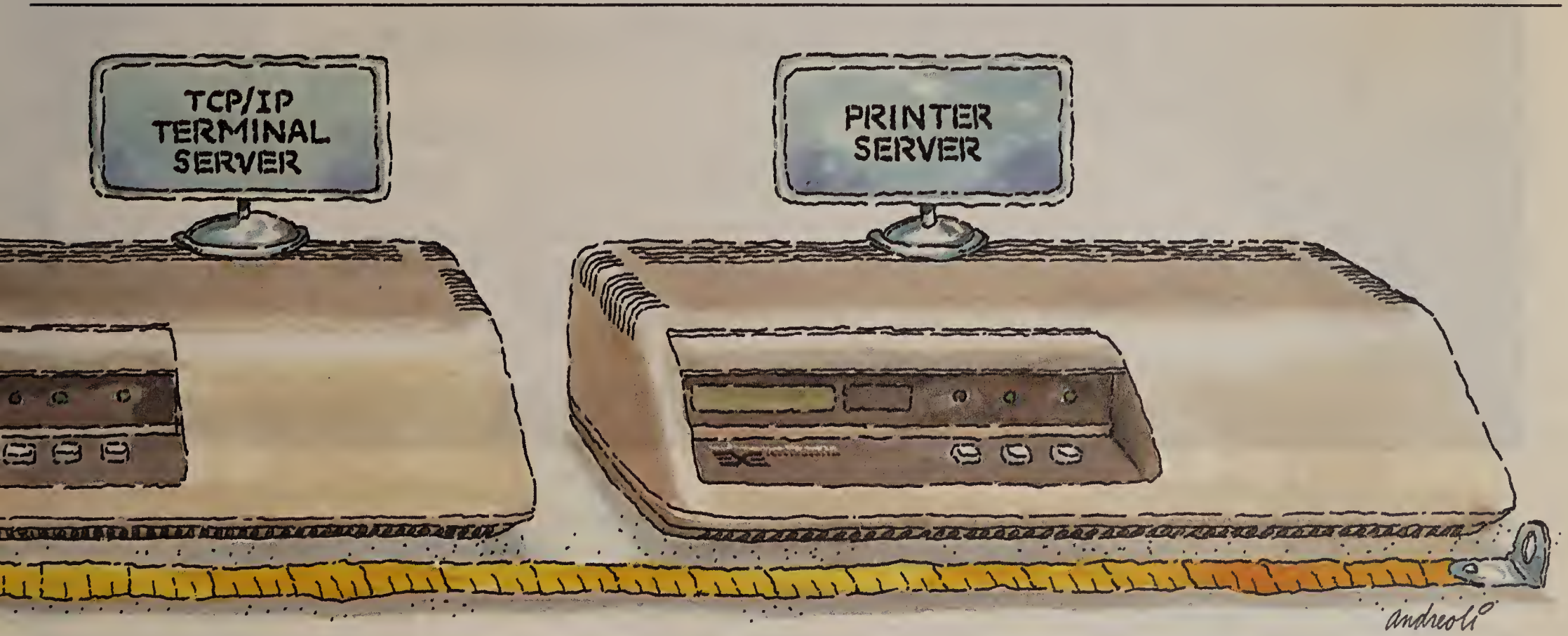
It is important to note that the PRI premises-based restoration is only required for the initial phases of SDDN. AT&T plans to move restoration capabilities into the network as soon as the required central office switch software is available, which should be about a year after SDDN's introduction.

Third, pricing is likely to be quite different. Accunet Switched 56 is treated much like voice service — usage-based with a first period/additional period pricing format. SDDN is likely to involve more complicated pricing. Rates will be comparable to present SDN schedules for similar (on-net to on-net and on-net to off-net) calls.

As of the end of 1989, exact pricing schedules had not been set for SDDN, but usage-based pricing seems likely. Under this format, calls would likely be on a per-minute basis.

AT&T said it wants to make long data sessions more economical. One way it could do this is through a tapered usage schedule, with one rate for the initial period (possibly 18 seconds), a lower rate for the next 20 incremental periods (possibly 6 seconds) and still lower rates for ensuing groups of incremental time periods.

And finally, unlike Accunet Switched 56K, SDDN will be available at all SDN serving offices.

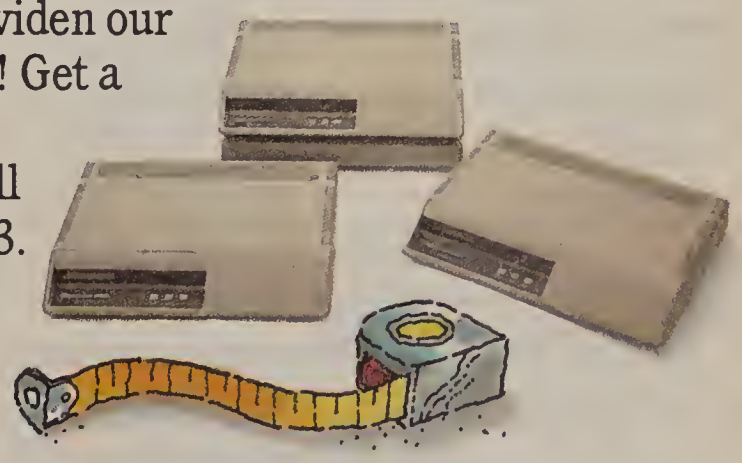


...a very wide range of options.

the same features for networking needs up to 8-ports.)

Our Performance 3000 Printer Server is the solution when you need to connect up to 4 high-speed parallel printers to a DEC Ethernet. The P3000 offers throughput levels of up to *3,000 lines per minute* for each! Nothing else even comes close.

And that's not all! Look for additional networking products from Emulex in the near future that will widen our line even further! Get a full measure of performance; call (800) EMULEX-3.



EMULEX

Emulex Corporation, 3545 Harbor Blvd., Costa Mesa, CA 92626, (800) EMULEX-3 or (714) 662-5600 in California International Offices: Wokingham (44) 734-772929; Munich (49) 89-3608020; North Sydney (61) 2-957-1669; Paris (33) 134-65-9191 DEC is a registered trademark of Digital Equipment Corp. ©1989 Emulex Corporation

See the FAXNeT Form on Page #51

How To Make Everybody Happy All Across The LAN.

Our new TS2 diskless workstation is made to deliver customer satisfaction.

Users will like the smart looks. The fan-free quiet operation. And how its small footprint frees up desk space.

They'll enjoy using the TS2. Its easily-adjustable tilt 14" monitor. And the easy-on-the-eyes sharp text and Hercules® graphics.

And users will make more productive use of it, because the TS2 delivers 80286 speed, power and performance, with MS DOS 3 and 4.0 compatibility.

Network administrators will like the quick set-up, faster on-line service. The TS2 comes complete with Ethernet® LAN interface board and Novell® NetWare® 2.1x compatible boot ROM. Or it can support other popular LAN interface boards. And the elimination of the local disk satisfies the need for more complete security.

Everyone will be pleased to know that the TS2 is the lowest-cost-per-user high performance network station available. Novell-certified. Built on 10 years of network experience with over two million system and terminal installations. And backed by a one-year limited warranty.

For more information fast, call toll-free or write today. TeleVideo Systems, Inc., 550 E. Brokaw Rd., P.O. Box 49048, San Jose, CA 95161-9048.

We want to make every customer happier about how their network works.

TeleVideo®

American Ingenuity. TeleVideo Know-How.

Call 1-800-835-3228

© 1989 TeleVideo Systems, Inc. TeleVideo is a registered trademark of TeleVideo Systems, Inc. All other product and brand names are trademarks and registered trademarks of their respective holders.

DATA COMMUNICATIONS

PRODUCTS, SERVICES, ARCHITECTURES, STANDARDS AND NETWORK MANAGEMENT

Worth Noting

Midlantic Corp., which operates 220 automated teller machines in the mid-Atlantic states, has joined the New York Cash Exchange ATM network, which already boasts access to 8,800 ATMs in 22 states.

Data Packets

Computer Network Technology Corp. (CNT) last week introduced a new version of its network management software that will enable IBM NetView users to monitor and control CNT's channel extenders.

The Network Curator Version 3 (NCV3), which is due out in the second quarter of 1990, will run on IBM VM-based mainframes and provide a link to net management software running on CNT's CHANNELink channel extenders. CHANNELink will be able to pass network alarms directly to NetView, bypassing IBM's NetView/PC product, and respond to configuration commands issued from the NetView console.

CNT said the second release of NCV3, due out in the third quarter of 1990, will run on MVS-based IBM mainframes. Future releases of NCV3 will link CHANNELink products to AT&T's Unified Network Management Architecture, Sun Microsystems, Inc.'s SunNet Manager and other network management systems supporting the Simple Network Management Protocol and Open Systems Interconnection network management protocols.

Previously, CHANNELink products were managed from an attached asynchronous terminal or an IBM Personal Computer running CNT software.

NCV3 software comes bundled in new CHANNELink products. Users can upgrade to NCV3 for a yet to be determined fee.

(continued on page 18)

ISDN addressing scheme to affect packet net users

E.164 plan adds to packet net buyers' checklist.

By Paul Desmond
Senior Writer

As ISDN rolls out into more and more cities, it brings with it a new addressing standard that users should add to the checklist they use when selecting a public network provider or packet-switch vendor.

The CCITT E.164 Numbering Plan standard defines the addressing scheme used in Integrated Services Digital Networks. It is based in large part on CCITT E.163, which is the public telephone network address standard, although E.164 adds more digits to that standard for a total of 15.

Addressing in X.25 and X.21 packet networks, however, is based on the X.121 addressing scheme, which varies from E.164 in length and the structure of various fields. For example, X.121 has a fixed-length field at the beginning of the address to identify the destination country, while E.164 uses a variable-length country field, according to Dennis Ernst, senior scientist at BT Tymnet, Inc., which operates the Tymnet packet network.

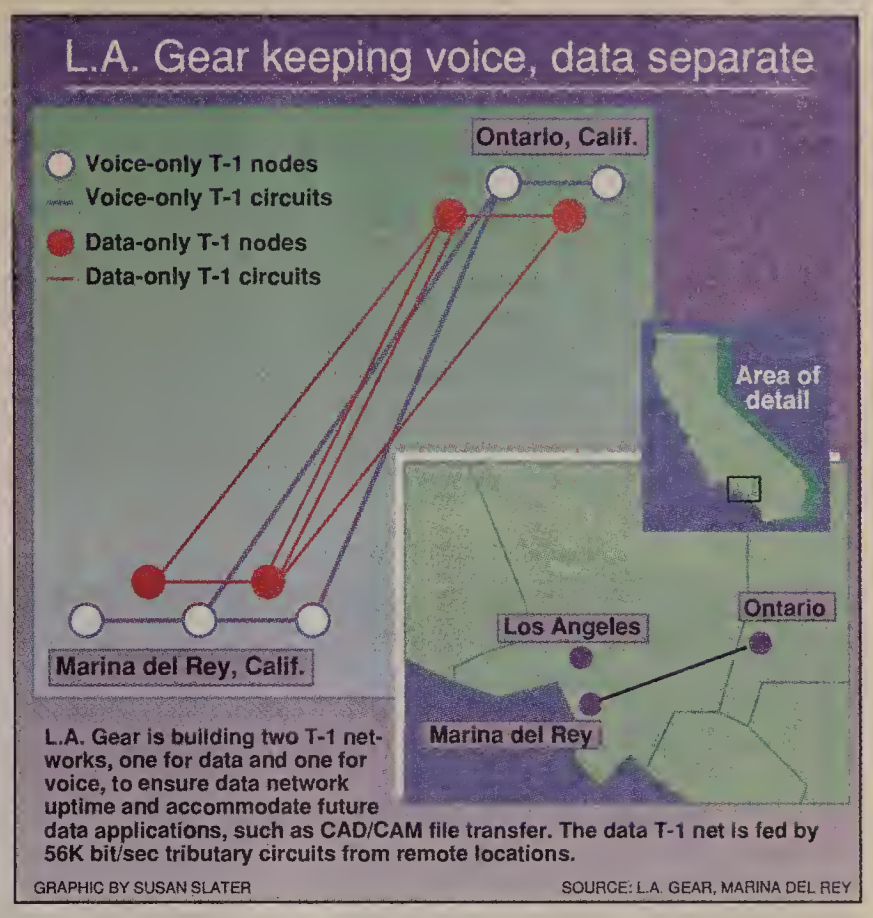
Such differences mean that packet net users that want access to ISDN will have to have some means to support the E.164 standard. Although there appears to be few such users today, the number is bound to increase as ISDN services become widespread.

"One of the things people have looked at using ISDN for is access to a carrier's packet-switched network," said Joaquin Gonzalez, an analyst with Meta Group, a consultancy in Westport, Conn. Users looking for such access will likely want to build hybrid networks that use both private facilities and public packet nets, and thus, will have to support both numbering standards, Gonzalez said.

> Although there appears to be few users today, the number is bound to increase.
>
> ▲▲▲

Some packet-switch vendors, such as Northern Telecom, Inc.,

(continued on page 18)



New nets put L.A. Gear on right foot

Separate voice and data T-1 networks to cut communications costs, augment order taking.

By Jim Brown
Senior Editor

MARINA DEL REY, Calif. — L.A. Gear, Inc. last week detailed its plans to build separate data and voice T-1 networks that will help the company reduce telecommunications costs and fill orders more quickly for its athletic shoes and other fashion products.

On the data side, the company is moving to a distributed processing environment supported by four Newbridge Networks Corp. 3600 Mainstreet T-1 multiplexers, which will enable employees at one company location to transparently access information at others.

Initially, the data-only T-1 net will link clusters of Hewlett-Packard Co. terminals in the company's 14 buildings to five HP 3000 minicomputers in a corporate data center here and a pair of HP 3000s in a data center in a distribution warehouse in nearby Ontario, Calif.

In the future, the T-1 network will provide links between 10 local-area networks housed in different L.A. Gear buildings. In addition, the T-1 network will eventually support file transfers between computer-aided design and manufacturing systems used by research and development engineers.

The voice network, which is partially installed, will be anchored by five Newbridge 3600 Mainstreets that will route voice calls between the corporate offices here and distribution facilities in Ontario.

The voice network will reduce the company's monthly telecommunications costs from $30,000 to $10,000.

"When I justified this project, I did it on voice savings alone," said Howard Seligman, MIS director.

He said he expects the overall network installation to pay for itself in three to five years.

> Seligman expects the overall net installation to pay for itself in three to five years.
>
> ▲▲▲

will have a payback period of two years, while the data network will pay for itself in approximately six years. L.A. Gear is spending close to $2 million for equipment and installation of the networks.

The network upgrade comes at a time of tremendous growth for L.A. Gear. Over the last two years, the company's sales have jumped from about $70 million to $600 million annually. During this period, MIS and communications departments have strained to provide just basic data processing and communications functions.

(continued on page 16)

Timeplex product digitizes faxes, speeds up routing

By Paul Desmond
Senior Writer

WOODCLIFF LAKE, N.J. — Timeplex, Inc. last week announced the Timeplex Fax Server, a device that lets users cut Group III facsimile costs by digitizing fax traffic for transmission across a corporate backbone.

Although Group III fax machines communicate at 9.6K bit/sec, integrating fax traffic into a digital network requires digitizing the analog fax output, a process that results in a 64K bit/sec data stream.

> "Anybody who has a T-1 net or digital facilities is a candidate for the [Fax Server]."
>
> ▲▲▲

Timeplex's Fax Server demodulates fax signals and reduces the bandwidth required to support fax traffic on digital backbones to 9.6K bit/sec, according to Frank Troccoli, Timeplex product manager. The device can be used with any multiplexer supporting synchronous data channels.

The traditional methods of saving bandwidth with voice calls, such as Adaptive Differential Pulse Code Modulation, can be used to reduce bandwidth requirements for fax traffic, but that still results in a 32K bit/sec data stream, meaning 27.2K bit/sec is wasted, Troccoli said.

Analysts said users have been waiting for a product like this.

"Anybody who has a T-1 network or their own private digital transmission facilities is a candidate for this," said Timothy Zerbiec, a principal with the Dedham, Mass., consultancy Vertical Systems Group.

Besides improving image quality, sending faxes digitally should speed up transmission because fax machines communicat-

(continued on page 16)

Timeplex product speeds, digitizes faxes

continued from page 15

ing over analog lines often fall back to 4.8K bit/sec due to poor line conditions, Zerbiec said.

The Fax Server typically transmits at 9.6K bit/sec, but it can also operate at 14.4K bit/sec in asynchronous mode and has a fallback rate of 4.8K bit/sec to allow for applications that include analog lines feeding in from remote locations.

The Fax Server has two ports: one to attach it to a data port on a multiplexer and the other to link it to a private branch exchange. Fax machines also linked to the PBX compete on a contention basis for use of the Fax Server, which supports traffic from one machine at a time.

Users with large amounts of fax traffic can use multiple Fax Servers to create a server pool.

The Fax Server also lets users dial into a PBX from the public switched network to send fax traffic to remote locations via the corporate backbone. For example, a user with a fax machine at home could dial into the corporate PBX to access the Fax Server, which would then route the transmission through a multiplexer to its destination, saving on long-distance charges.

Users that need to support only a single fax machine can use Timeplex's Link Packetized Voice Subsystem-8 (LPVS-8) instead of a multiplexer to support the Fax Server. LPVS-8 supports eight voice channels and one 9.6K bit/sec data channel over a single 56K bit/sec digital data service link. The Fax Server is available now for $2,795.

New nets put L.A. Gear on right foot

continued from page 15

"We've always been running flat out just to keep up," said Sam Schorr, director of software development in the MIS department. "We're now in a position to begin addressing all the things that stem from that growth."

One of those concerns is the need to create a distributed processing environment in which applications running on one HP 3000 can transparently retrieve data stored on another.

To support this distributed processing, each of L.A. Gear's seven HP 3000s will run HP's TurboImage XL data base management system software, HP's Network Services 3000 communications software and Quest Software, Inc.'s NetBase software. The HP 3000s will be interconnected via 56K bit/sec channels on the T-1 network.

The NetBase software will distribute a directory to each HP 3000 that lists files stored on all the processors. NetBase detects when an application running on one system requires data from another and instructs HP Network Services 3000 to invoke commands needed to establish a link with the remote system and retrieve the necessary data.

"Strategically, we want to be able to know what is going on at any given point in time, anywhere in the company," Schorr said.

The network will enable L.A. Gear to enter orders on the corporate HP 3000s and download them to processors at the distribution center, where the orders will be filled. The net will also enable clerks in the distribution center to upload order status and inventory data to the corporate systems.

"The primary thing for us is to ship shoes as quickly as we can," Schorr said. "To do that, you have to have a substantial network in place."

Currently, HP terminals in each L.A. Gear building are linked to Network Equipment Technologies, Inc. SPX statistical multiplexers. Those SPXs are linked via 56K bit/sec digital circuits to either the HP 3000s at the corporate data center or at the distribution center. Some of the SPXs support multiple 56K bit/sec links that connect terminals in that location to both the corporate headquarters and the distribution center.

Those statistical multiplexers will remain in the network. Some will be linked directly to ports on a T-1 multiplexer in the same building; SPXs in remote locations will support 56K bit/sec feeder circuits to the nearest T-1 node.

The HP minicomputers in both data centers are linked via Ethernet LANs. Currently, the two LANs are interconnected via Vitalink Communications Corp. bridges that support four 56K bit/sec links. L.A. Gear is replacing those point-to-point links by connecting the Vitalink bridges to 56K bit/sec channels on T-1 circuits between the sites.

Once the HP 3000s are linked together by the T-1 net, L.A. Gear will install a series of Wellfleet Communications Corp. bridges that will link its existing LANs to the data T-1 backbone.

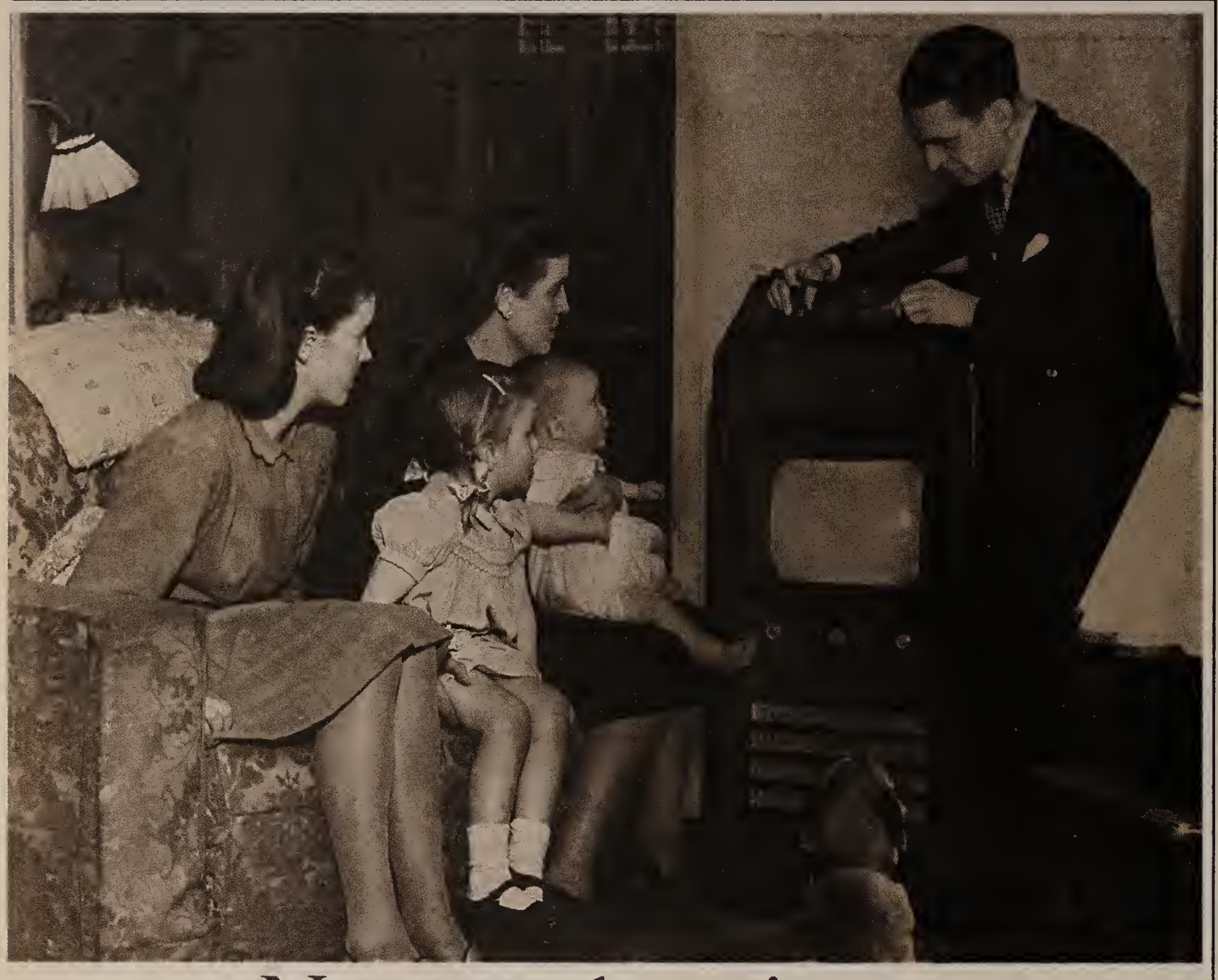
L.A. Gear opted for Wellfleet bridges because Wellfleet has been working with Newbridge to ensure that its products work with Newbridge's T-1 multiplexers, according to Andy Marks, manager of data communications.

Marks said he expects the LANs will be interconnected via the T-1 network within the next 60 days. The primary purpose of this effort is to let microcomputer users on each LAN exchange electronic mail.

L.A. Gear has left spare capacity on the data T-1 network to support those LAN interconnections. In addition, spreading voice and data transmission across two networks enables L.A. Gear to ensure greater uptime on both networks.

"With the amount of data we will be running over this network, we justified the extra cost of dedicating a network to data instead of having data and voice sharing a single network," Marks said.

Nodes for both the data and voice T-1 networks will be collocated in four locations, and one location will support a single voice node. "If one network goes down, we can piggyback the traffic onto the other one," Seligman said.



Never underestimate the power of a new idea.

Like other new ideas that have changed the way we work or live, facsimile is dramatically changing business communications.

Now, Canon has taken this technology even further with a revolutionary new facsimile system that can utilize both standard G3 and enhanced G4 technology *simultaneously.*

Instead of having to replace your entire network to get G4 performance, Canon's exclusive OCR "CoverScan" technology lets an existing G3 fax take advantage of the advanced networking features of the FAX-L6500.

Which means you can combine high-speed digital networks like AT&T's Accunet Switched 56* with Canon FAX-L6500s and Group 3 facsimiles to create your own low-cost digital facsimile network.

Add in features like hard disk storage, image resolution surpassing desktop publishing, 3-second transmission,** and a 2,500-sheet paper capacity, and even the biggest fax jobs come down to size.

So if your business is looking to take the next step into the future of facsimile technology, see your Authorized Canon Dealer to take a look at the new Canon FAX-L6500. A new idea that could be your next step ahead of the competition.

*Accunet Switched 56 is a registered trademark of AT&T.
**Based on CCITT #1 Chart. 64kbps in standard mode.

G4 DIGITAL

Canon
FAX-L6500
COMMUNICATING QUALITY

Enjoy easy extended payments with the Canon Credit Card. Ask for details at participating Canon dealers and retailers. Available only in US. © 1989 Canon U.S.A. Inc.

1989 "Manufacturer of the Year"
Awarded by National Office Machine Dealers Association to Canon USA Inc. for outstanding dealer support.

For Universal Connectivity, GDC Has Raised The Standards.

To Meet All Your Business Needs, No Dial-Up Modem Can Top Our New Multi-Speed.

For over twenty years GDC has been setting the standard in modems. And our new multi-speed is no exception.

In fact, it is so connectible, it could be the last modem you'll ever have to buy.

That's because it will satisfy all your business applications. Fast or slow. And it will automatically choose the right speed for any application – from 300 bps to 9,600 bps and even beyond, with compression.

Our new multi-speed conforms to an unprecedented number of national and international standards. So you now have the powerful connectivity you need to communicate across town, across country, or across the world. All right at your fingertips, from one totally integrated modem.

Consider, too, that by following a communications strategy which adheres to clearly defined worldwide standards, you'll be securing the future growth of your network for years to come.

Of course there's much more.

Like Multiple Dialers including AT command set, V.25 bis sync and async, or 801 ACU support. It's configurable by switch, by software, or both. It has an Auto-Dial feature that stores 10 numbers. And it's easy to use, with multiple help screens should you need them.

Also, our multi-speed modem is available as a family. With desktop, rackmount, and standalone models available. At remarkably low prices.

You get all this plus GDC's leadership, experience, and our worldwide service and support organization.

So find out more. Because it's worth remembering that the only standard high enough for GDC, is our own.

Call **1-800-777-4005,** General DataComm, Middlebury, CT 06762-1299. Tel: (203) 574-1118, Telex: 643357, Fax: (203) 758-8507.

In Data Communications, There's Only One General

General DataComm

See Our Live Demonstration at Comnet '90, Feb. 6-8, Washington Convention Center, Booth 1138; Ramada Renaissance, Booth R-42.

UK – 44-734-774868, BELGIUM – 32-14-425851, WEST GERMANY – 49-911-2379-165, AUSTRALIA – 61-2-956-5099, HONG KONG – 852-5-833-6779, JAPAN – 81-3-862-1730, CANADA – 416-498-5100. MNP is a trademark of Microcom, Inc.

See the FAXNeT Form on Page #51

Addressing scheme to affect users

continued from page 15

have already announced support for E.164 in their switches, which means users of such equipment can employ either the E.164 or X.121 standard.

Doug Kaye, network engineer for Northern Telecom, said E.164 represents a logical evolution as voice and data nets are integrated because it will let users employ the same scheme for voice and data.

E.164 is also easier to use than X.121 because it closely follows the traditional telephone network numbering scheme, he said. X.121 addresses can vary from one network to another.

Supporting E.164 on existing packet networks is not a Herculean task, according to Kathy Dally, senior staff consultant at Omnicom, Inc. in Vienna, Va.

"It may simply be enough for the switch to recognize that the number is indeed an ISDN number and route that call to a single point of internetworking with ISDN," said Dally, a former chairwoman of ANSI's X3S3.7 Task Group, which is responsible for the U.S. position on X.25 and X.121.

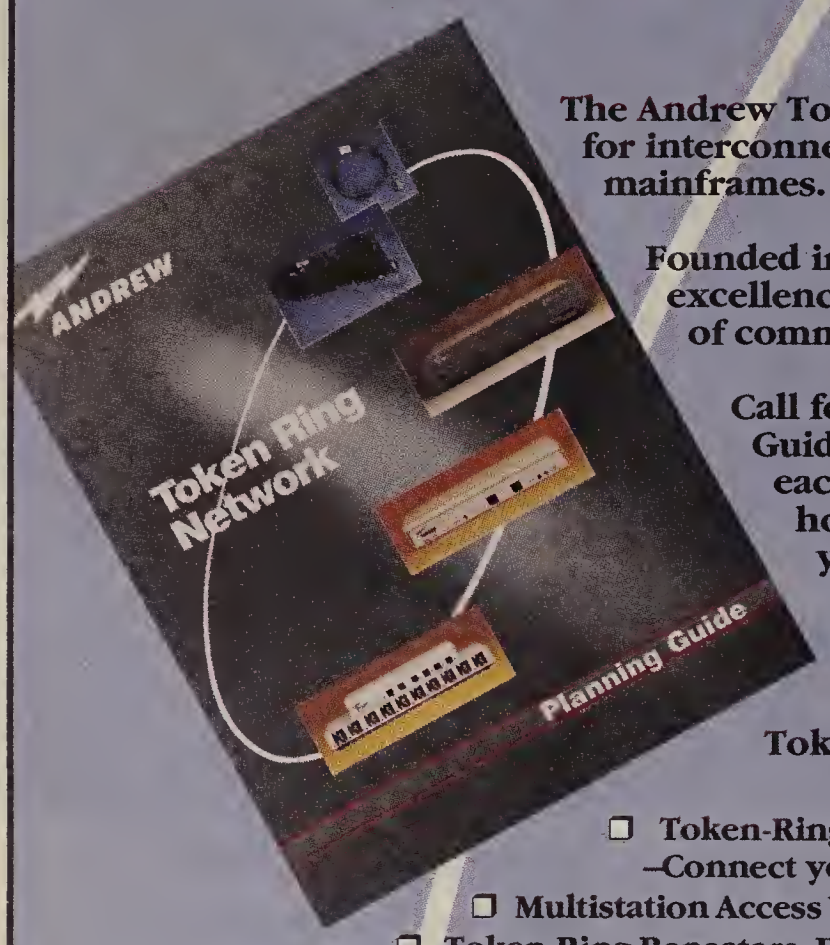
> Supporting E.164 on existing nets is not a Herculean task.
>
> ▲▲▲

The CCITT has devised an escape code mechanism that lets users send messages from an X.121-based network to an E.164-based net, and vice versa, Ernst said.

In either case, the plan calls for placing a zero before the address. Thus, a user on an X.121 network who wants to send data to a user on an E.164-based net puts a zero in the file. That zero tells the switch that the address is not X.121. The switch then routes the call to an ISDN gateway.

Ernst agreed that it should not be a major problem for most vendors to support E.164 in their switches, but he added that it is something users should be aware of when buying packet-switching equipment and services. "Make sure the vendor has a reasonable scheme for connecting to a public network that could then convey a call to an ISDN network," he advised.

BUILD YOUR TOKEN-RING NETWORK WITH ANDREW



The Andrew Token-Ring System is a complete system for interconnection of PCs, minicomputers and mainframes.

Founded in 1937, Andrew brings a tradition of excellence in design and service to the world of communications.

Call for our free Token-Ring Planning Guide. The guide explains the purpose of each component of the ring and shows how they work together. We'll help you select the proper components to build your network.

Andrew Token-Ring products are fully compatible with the IBM Token-Ring Network and include:

- ❑ Token-Ring Adapter Cards –Connect your PC to the Network!
- ❑ Multistation Access Units (MAUs)
- ❑ Token-Ring Repeaters–For extended distance capability.
- ❑ Source-routing Token-Ring Bridges

Andrew...for reduced installation costs and uncomplicated solutions for all your network needs. Call us!

ANDREW
Torrance, California
(213) 320-7126

CALL 1-800-733-0331 ext. 3101
for your FREE Token-Ring Planning Guide

See the FAXNeT Form on Page #51

See Us At Networld In Boston 2/13-15/90

Andrew products are available worldwide. Call for a distributor in your area, in the UK 0734-894689, in Canada 800-267-1821.
IBM is a registered trademark of International Business Machines Corporation. © 1989 Andrew Corporation.

Data Packets

continued from page 15

The Aries Group, Inc.-MPSG recently announced software that helps users design hybrid VSAT/terrestrial networks.

The Aries Group's Vantage-VSAT Siting and Design System, is a mainframe-based, menu-driven program that prompts users through a series of operational considerations, such as roof rights and quality of local exchange carrier service, to determine where very small aperture terminals would be an attractive alternative to terrestrial lines.

The software runs on The Aries Group's mainframe, and users access it through BT Tymnet, Inc.'s public data network.

The system takes into account terrestrial line costs to determine the optimum placement of VSATs, which will act as hubs for terrestrial lines from surrounding sites.

The cost of the hybrid VSAT/terrestrial network can be compared to the cost of an all-terrestrial network using the Aries Data Network Design Program, a separate program that is also accessed through Tymnet. The Aries Group said the hybrid VSAT/terrestrial design has resulted in cost savings of up to 50% for some users.

Although costs vary according to the size of the network, the Vantage analysis and design cost for a 500-site network is about $1,000, which includes Tymnet charges. For more information, contact The Aries Group, 1350 Piccard Drive, Suite 300, Rockville, Md. 20850; (301) 840-0800.

TTNet, one of Japan's major common carriers, has ordered 100 **PictureTel Corp.** custom-engineered coder/decoders (codec), which the carrier will use as part of a widespread implementation of full-motion color videophones in Japan.

TTNet will provide videophones built by its parent company, Tokyo Electric Power Co. The videophones include the PictureTel codec, a color monitor, a digitizing tablet on which users can draw messages interactively and two cameras. One camera shows the user's face and the other can be focused on documents.

Customers will be able to use the videophones to deliver and receive quality motion images over dial-up digital networks.

The codecs that PictureTel will provide are customized versions of the company's C-3000 codec.

ShareBase Corp. of Los Gatos, Calif., recently announced that AT&T purchased five ShareBase SQL data base servers valued at $2.5 million. The purchase includes four ShareBase Server/8000 systems and one Server/700.

The Server/8000 is ShareBase's Reduced Instruction Set Computer-based SQL server that can manage 100G bytes of data and as many as 400 users. The Server/700, based on a Zilog, Inc. Z8000 microprocessor, can support up to 16G bytes of data and about 150 users.

The four Server/8000s will be utilized within AT&T's Software-Defined Network virtual network service for loading and maintaining such data as network configuration information, telephone numbers and restricted user lists, providing relational data base management for AT&T 3B minicomputers running Unix System V.

The Server/700 joins two other ShareBase Servers in use on the Federal Telecommunications System 2000 government network. Having purchased more than 160 data base servers since 1981, AT&T is ShareBase's largest customer.

Worth Noting

"Sales of Open Systems Interconnection products will reach $280 million this year. By 1993, however, OSI sales will rise to $1.7 billion."

Mike Howard
Vice-president
Infonetics, Inc.
Santa Clara, Calif.

Netnotes

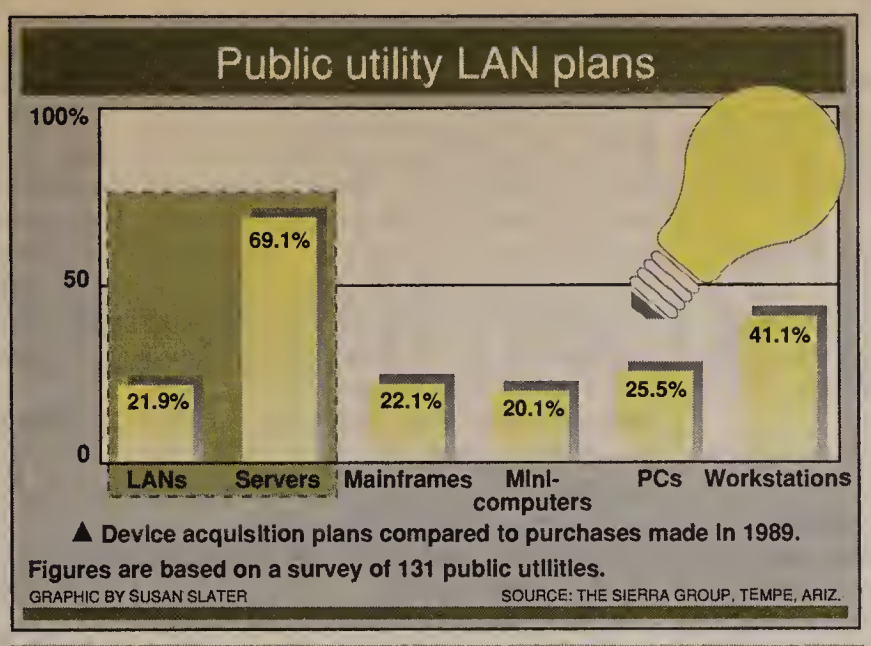
Chip manufacturer **Advanced Micro Devices, Inc. (AMD)** of Sunnyvale, Calif., recently announced the successful completion of a six-vendor interoperability test of the most recent station management standard for the emerging Fiber Distributed Data Interface (FDDI).

Station management is one of four pieces of FDDI and the only portion that has yet to be completed. It defines network management services for 100M bit/sec FDDI fiber networks and will provide a higher level of fault tolerance, fault detection and fault localization than is offered by conventional local-area net technologies, such as Ethernet and token ring.

The test, conducted at AMD facilities, involved AMD and five FDDI vendors: Communication Machinery Corp., Fibronics International, Inc., Proteon, Inc., Sun Microsystems, Inc. and Synernetics, Inc. Stations from each of the six companies, all incorporating AMD's SuperNet FDDI chipset, were able to communicate with one another using FDDI's physical layer, media access control (MAC) protocols, station management protocols and physical medium dependent (PMD) facilities.

The physical, MAC and PMD portions have been approved as part of the FDDI standard. Version 5.1 of station management, the subject of the interoperability test, is the first draft standard of station management that should be able to coexist on the same net with the final standard.

(continued on page 20)



▲ Device acquisition plans compared to purchases made in 1989.
Figures are based on a survey of 131 public utilities.
GRAPHIC BY SUSAN SLATER SOURCE: THE SIERRA GROUP, TEMPE, ARIZ.

Early user lauds Proteon's unshielded 16M token LAN

Company looks to future with high speed net.

By Laura DiDio
Senior Editor

CHATHAM, N.J. — Hoechst Celanese Corp.'s Engineering Plastics Division, one of the first users of Proteon, Inc.'s 16M bit/sec token-ring network equipment for unshielded twisted-pair wire, gives the product high marks for performance.

The ProNet 70 Intelligent Wire Center (IWC) is an intelligent wiring hub that can be used in star-wired configurations to support 4M, 10M and 16M bit/sec token-ring local-area networks on unshielded wire.

Hoechst Celanese was attracted to the ProNet 70 IWC because it is the only product available that can support 16M bit/sec LANs on unshielded wire.

Lorie Mouklaf, a senior systems analyst at Hoechst Celanese, said the company has experienced no problems with the ProNet 70 IWC. "It works fine; I'm very satisfied," Mouklaf said. "Now we just have to wait to get the new Novell [Inc.] device drivers to get the token-ring running at its full 16M bit/sec capacity."

Mouklaf and other users have said — and Novell acknowledges — that the original NetWare drivers for 16M bit/sec LANs are not sophisticated enough to unlock the potential of these high-speed networks (Novell to redress 16M token net problems, *NW*, Jan 8).

Hoechst Celanese installed the ProNet 70 IWC in its Management Services Group to support a variety of applications, including customer credit checks, data base entry and spreadsheets. The 16M bit/sec token ring ties an IBM Personal System/2 Model 80 file server to 30 IBM Personal System/2 Models 50, 60 and 70.

Mouklaf said Hoechst Celanese has standardized on usage of unshielded twisted-pair wiring in its corporate facilities and that it made sense for his company to install a 16M bit/sec token-ring net now.

"There's only a $200 price differential between the cost of the 4M bit/sec and 16M/4M bit/sec adapters," he noted. "And by doing it now, we not only get to experiment with the technology before most other users, but we're also confident that we've made a cost-effective investment that will meet our networking needs for the next five years," Mouklaf said.

The company wanted to install a 16M bit/sec IBM Token-Ring LAN as quickly as possible in anticipation of running sophisticated graphics imaging applications and IBM's OfficeVision software within the next two years.

"The simple word processing files that we have now consume only about 8K bytes of memory. But in the future, we expect to use graphics files that can consume as much as 200K bytes of storage memory," Mouklaf said. "To transmit graphics files over the network quickly requires high 16M bit/sec bandwidth."

"The [ProNet 70 IWC] works fine," Mouklaf said. "Now we just have to wait to get the new Novell device drivers to get the token-ring running at its full 16M bit/sec capacity."

▲▲▲

Farallon strategy tied to evolution of ISDN

Company president sees LAN migration to phone wire as force driving convergence with telecom.

By Susan Breidenbach
West Coast Bureau Chief

EMERYVILLE, Calif. — While other local-area network vendors charge into the new decade armed with superservers and ever more complex network operating systems, Farallon Computing, Inc. is looking in a different direction — toward Integrated Services Digital Networks.

As Farallon sees it, the increasing use of telephone cabling in LANs is forcing computer networking and telecommunications to converge, and ISDN provides a natural meeting place for the technologies.

Farallon's flagship offerings — the PhoneNet line of connectors, hubs and repeaters for networking Apple Computer, Inc. Macintoshes using standard telephone wire — were designed to evolve alongside ISDN, as were the company's more recently introduced software products.

"Our primary focus is to develop front-end applications for ISDN," said Reese Jones, president and founder of Farallon. The company's Timbuktu product, which lets one Macintosh control another across a LAN or dial-up phone line, is one of the ISDN applications AT&T and Northern Telecom, Inc. are using to show off the capabilities of ISDN to prospective customers.

The firm's image is a far cry from what it was when Farallon was established four years ago.

At that time, Jones, a biophysicist conducting medical imaging research at Lawrence Berkeley

(continued on page 20)

CMC unveils $10K FDDI interface for VMEbus CPUs

By Susan Breidenbach
West Coast Bureau Chief

SANTA BARBARA, Calif. — Communication Machinery Corp. (CMC) is expected to apply some downward pressure on the price of Fiber Distributed Data Interface (FDDI) networks with the introduction today of boards for VMEbus systems that are priced at less than $10,000 each.

According to CMC, the CMC-1055 single-ring and CMC-1056 dual-ring interfaces for systems based on VMEbuses are priced lower and offer higher performance than other FDDI VMEbus adapters.

Throughput with Sun

CMC said the CMC-1056 in a Sun Microsystems Corp. 4/260 workstation achieved a sustained throughput of 44M bit/sec using Sun's standard Transmission Control Protocol/Internet Protocols.

"This is 66% faster than Sun's published performance for its FDDI/DX board, and the CMC-1056 is priced 20% less than the Sun product," said Russell Sharer, director of strategic planning and marketing programs for CMC, a wholly owned subsidiary of Rockwell International Corp.

Sharer said the CMC-1055 and CMC-1056 boards were further distinguished from the competition because they are already shipping and have complete FDDI station management software.

Station management is the only portion of the FDDI standard that has yet to be finalized by ANSI, but CMC's software conforms with the latest draft standard — ANSI X3T9.5 Version 5.1 — and can be upgraded as required, CMC said.

Interoperability demo

CMC's station management implementation was used recently in a five-vendor station management interoperability demonstration sponsored by Advanced Micro Devices, Inc. (AMD), an FDDI chipset manufacturer.

The CMC-1055 and CMC-1056 both have a 25-MHz AMD 29000 Reduced Instruction Set Computer microprocessor, multiple internal buses, 512K bytes of dynamic random-access memory for protocol execution and 512K bytes of video RAM for packet processing.

This architecture lets protocol processing, and VMEbus and network transfers occur simultaneously.

It also enables the CMC-1056 to process up to 30,000 packet/sec, CMC said.

The CMC-1056, with two physical connections to FDDI, is priced at $9,950, and the single-connection CMC-1055 is priced at $8,950.

Netnotes

continued from page 19

Madge Networks, Inc. recently introduced a software driver that significantly boosts the speed of its Smart AT Ringnode and Smart MC Ringnode token-ring interface cards.

Initially developed for Madge Networks' new Smart 16/4 EISA Ringnode adapter, the Smart Server software also enables the company's existing token-ring interfaces for microcomputers based on the Extended Industry-Standard Architecture and the IBM Micro Channel Architecture (MCA) to transfer data at 98% of the full token-ring speed.

"That's 50% faster than the previous generation of Smart software and, unquestionably, the fastest 4M bit/sec token-ring speed on the market today," said Robert Madge, president of Madge Networks.

Smart Server runs special server control software on a dedicated communications processor of the token-ring adapter, bypassing the bottlenecks usually associated with token-ring boards. To maximize network throughput, low-level network activity is off-loaded to the adapter, freeing up the file server for other net services.

The Smart Server software automatically configures itself to the interruptions and I/O addresses of existing Smart Ringnode adapters. The random-access memory-based design of the Ringnode boards enables users to download new versions of protocols or Smart software as they become available, reducing the need for hardware upgrades.

The software is being offered to users of the Smart AT and Smart MCA adapters at no charge. Smart Server is currently available for Novell, Inc.'s NetWare, and a version for all Network Basic I/O System-compatible network operating systems, including IBM's PC LAN Program and Microsoft Corp.'s LAN Manager, will follow by the end of the first quarter.

UUNET Communications Services, Inc., a nonprofit corporation in Falls Church, Va., is offering commercial enterprises an international Transmission Control Protocol/Internet Protocol internetworking service.

Called AlterNet, the new service is similar to those provided by the Internet, a TCP/IP network connecting colleges and universities. However, because the Internet is heavily subsidized by the federal government, its use has been mostly restricted to organizations doing government-sponsored or government-approved research.

According to UUNET, a dedicated 56K bit/sec AlterNet line between California and Paris costs less than $3,500 per month. Small to midsize companies that cannot afford dedicated lines can share the UUNET infrastructure as needed for $1,900 per month plus the telephone company cost of accessing AlterNet's nearest hub. Alternatively, a shared 9.6K bit/sec service is available in some areas for as low as $250 per month.

Farallon strategy tied to evolution of ISDN

continued from page 19

Laboratories, was heading up the Berkeley Macintosh Users Group (BMUG), an organization he founded.

He needed a way to connect a Macintosh in his upstairs office to another one in the BMUG office downstairs so the two could share a LaserWriter printer. Instead of stringing coaxial cable through his home, Jones decided to try using the unused pair of wire in an existing telephone line.

The product he designed to solve the problem was the original PhoneNet connector, a box that plugged into the LocalTalk port on his Macintosh and supported unshielded, twisted-pair phone wire. The connector was initially sold to BMUG users as components in a plastic baggie.

"We would have make-your-own-cable nights," Jones recalled.

Word spread about PhoneNet to companies, such as The TOPS Division of Sun Microsystems, Inc., that wanted to order assembled connectors in large quantities, and Farallon was formed. Today, PhoneNet is used as the cabling system in 70% of all Macintosh networks containing more than two computers, and the company has been forced to move to larger facilities with each birthday.

Nearly one-third of the company's 160 employees are involved in research and development efforts to combine computers and telecommunications more effectively and to help provide a migration path from the traditional analog phone system to ISDN.

"We want to provide users with transparent interoperability across the three basic types of plumbing we support: analog phones, LANs and ISDN," Jones said. Farallon now has a line of Ethernet hardware for unshielded, twisted-pair wire, as well as a few recording products — MacRecorder and ScreenRecorder — that together can be used to produce multimedia applications.

The ScreenRecorder will record the successive screens displayed in a Macintosh session, producing a videotape that can be played back at various speeds for purposes such as demonstrations or training sessions. In a LAN environment, these sessions can be broadcast to multiple users. Also, a user with the appropriate permission can record a session being conducted by someone else on another computer.

> "We want to provide users with transparent interoperability across analog phones, LANs and ISDN."
>
> ▲▲▲

> "We would have make-your-own-cable nights," Farallon President Jones recalled.
>
> ▲▲▲

Users can enhance the taped sessions by recording voice explanations of what is taking place. The vehicle for this is the MacRecorder, a sound digitizer that lets users record voice input through a built-in microphone, an external microphone or a line-in source, and then edit or play the sound back.

Such multimedia applications improve personal computer communications in situations where the individuals doing the communicating are separated by time or space, Jones said.

"We focus on personal communications, not enterprise networking," he said. "A user wants to talk to another person, not to a mainframe or a file server. Voice, imaging and video are irrelevant when you're talking to a server, but they're important when talking to a person."

Jones, who cut his computing teeth on Unix, believes that network operating systems could start going the way of the dinosaur before the middle of the decade as the Macintosh and personal computer operating systems start incorporating more networking functionality.

"In Unix, all the networking is given away as part of the basic operating system," Jones said. "Any Unix box can be configured as a file server, a router or a gateway."

The Macintosh operating system seems to be following the Unix example. The current version includes the client portion of the AppleShare networking software, while the forthcoming Release 7.0 will include the server piece as well.

Jones scoffs at the notion that the 64K bit/sec speed of the ISDN Basic Rate Interface (BRI) and 1.54 bit/sec speed of the Primary Rate Interface (PRI) are too slow for companies that already have 10M bit/sec Ethernet, 16M bit/sec token-ring and 100M bit/sec Fiber Distributed Data Interface networks.

The BRI gives each user two private 64K bit/sec channels, which provide about the same throughput as a 238K bit/sec LocalTalk network shared by four people, Jones said.

Similarly, the best actual throughput a 10M bit/sec Ethernet LAN can achieve is approximately 3M bit/sec, "and that's when only one person is using the network," he added. When several people start using an Ethernet at once, its performance drops down to about the 1.544M bit/sec PRI speed, Jones said.

ISDN links won't provide a 1-to-1 replacement for LANs because LANs connect each user to every other user continuously, whereas ISDN links have to be established individually. ISDN does, however, offer a measure of physical security that LANs lack because each user essentially gets a private line. Data going across the link cannot be "sniffed" out by someone elsewhere on the network using diagnostic tools, as it can be on LANs.

Jones is the first to admit that ISDN can't do much that can't be accomplished with a modem and T-1 lines. Only a handful of metropolitan areas offer ISDN services, and ISDN communications can only be achieved within a single service area, not between areas.

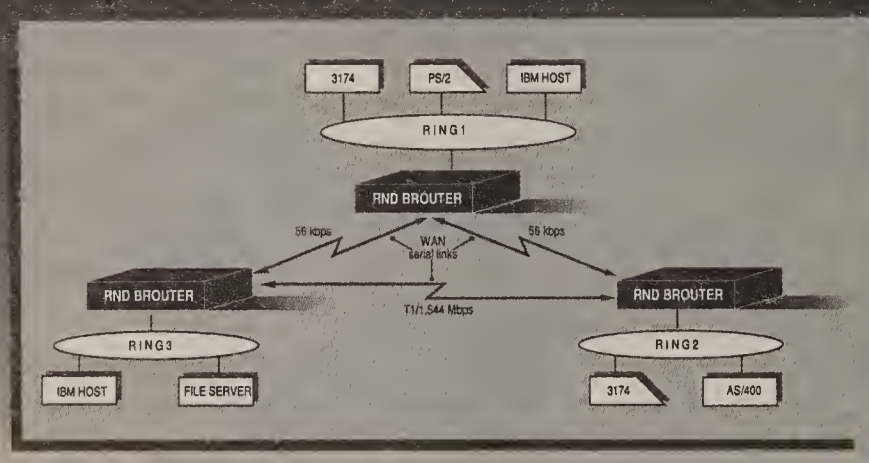
Jones said he expects the adoption of ISDN to be similar to that of push-button phones, though he hopes it won't take as long. Push-button service was first introduced in 1962, but it is still not available everywhere in the country.

"Hopefully, we'll see [widespread ISDN] in our lifetime," Jones said.

FOR NETWORKS WITH AMBITION

RND

Token-Ring Brouters.



RTB remote bridge/routers – brouters – from RND connect token-ring/IEEE 802.5 LANs at different locations, making communications possible within an integrated LAN/WAN network.

STRing – SOURCE AND TRANSPARENT ROUTING

Use RTB remote brouters in any combination for the most cost-effective network solution. As smart devices, they operate transparently in a multi-vendor/protocol environment and optimize traffic load distribution by using both source routing (IBM®/IEEE standard) and transparent routing.

MULTIPLE SERIAL LINKS

- *One to four WAN links, data rates from 4.8 kbps to 2.048 Mbps.*
- *Active loop support*
- *Quick alternate routing*
- *Load balancing/sharing*

Other features include:

- *Traffic control, including user-defined filters*
- *Bilateral access control*

NETWORK MANAGEMENT

A comprehensive management system provides tools for network display, configuration and control.

RAD

RND

See how our brouters and your LANs can work together. Contact RND today.

IBM, PS/2, AS/400 are registered trademarks of International Business Machines.

See us at ComNet Booth #2037.

RAD Network Devices

U.S.: 151 W. Passaic St., Rochelle Park, NJ 07662, tel. (201) 587-8822, tlx. 6502403647 MCI, fax (201) 587-8847

C&C Computers and Communications

NEC expands its commitment to the future.

In an era of complex communications, real leadership means a commitment to the future — A commitment of people, resources and technology.

As a major step in our expanding commitment to the future of our customers' communications, NEC is proud to announce the establishment of two new direct sales subsidiaries in the Eastern and Central U.S. These organizations join our existing direct sales operation in the Western U.S.

Headed by three telecommunications veterans, each with over 20 years of industry experience, these three subsidiaries will enhance NEC's existing mix of direct sales operations and independent distribution channels. This expansion in resources will enable NEC to respond more effectively to customer demands for customized solutions and better systems integration, while improving customer access to NEC's advanced technology and applications.

For further information, please call 1-800-626-4952.

NEC Business Communication Systems (East), Inc.
David M. Montanaro, President

NEC Business Communication Systems (Central), Inc.
Thomas J. Burger, President

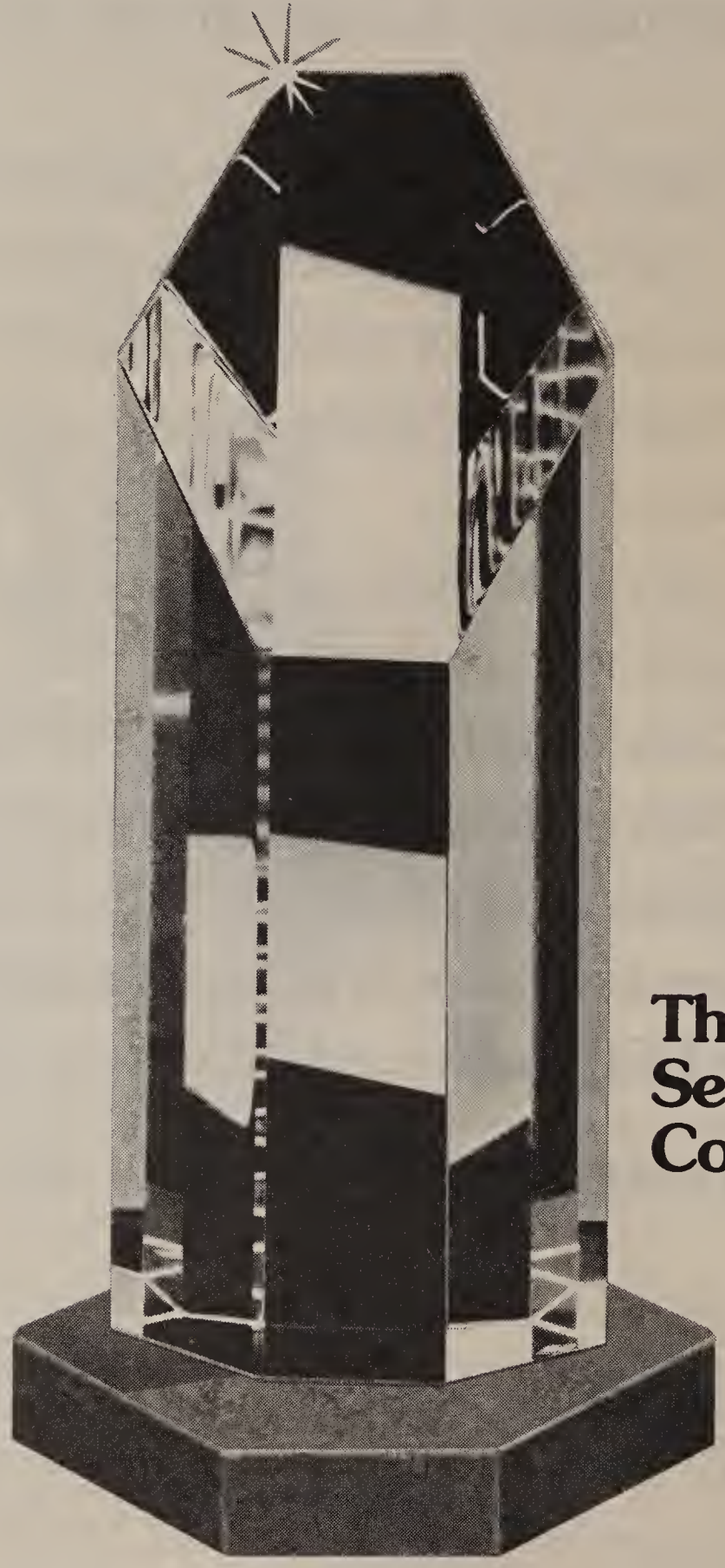
NEC Business Communication Systems (West), Inc.
Alex D. Baker, President

NEC

• Communications • Computers • Electron Devices • Home Electronics •

Enterprise Networkings'

Mark Of Excellence



The Search Continues.

THE ENNE℠ AWARDS

Honoring The Best Of The Best.

Call, or write for your ENNE Award Nomination Forms today. And salute those who are defining tomorrow.

THE ENNE AWARDS PROGRAM 305 Madison Avenue, Suite 1424, New York, NY 10165 212 983-4965

Dialogue

Should the federal or state courts rule on how automatic number identification (ANI) can be used by the telephone companies?

"Automatic number identification is more of an issue for the federal government than the states. It seems pointless to let states get involved because of the nature of the technology. If half the states have ANI and half the states don't, you're talking about a useless technology."

Stephen Carnilla
Director of telecommunications
University of Chicago

"As a businessman, I want ANI because it provides information that can improve our company's productivity. But I also believe that private consumers have the right to request that their telephone number not be transmitted to other people.

"Ultimately, ANI is an issue for the Supreme Court. There doesn't seem to be a right or wrong answer.

"All kinds of customer information is already available and sold, and much more than just telephone numbers. If the courts start ruling on ANI, they will probably have to also consider the practice of selling mailing lists."

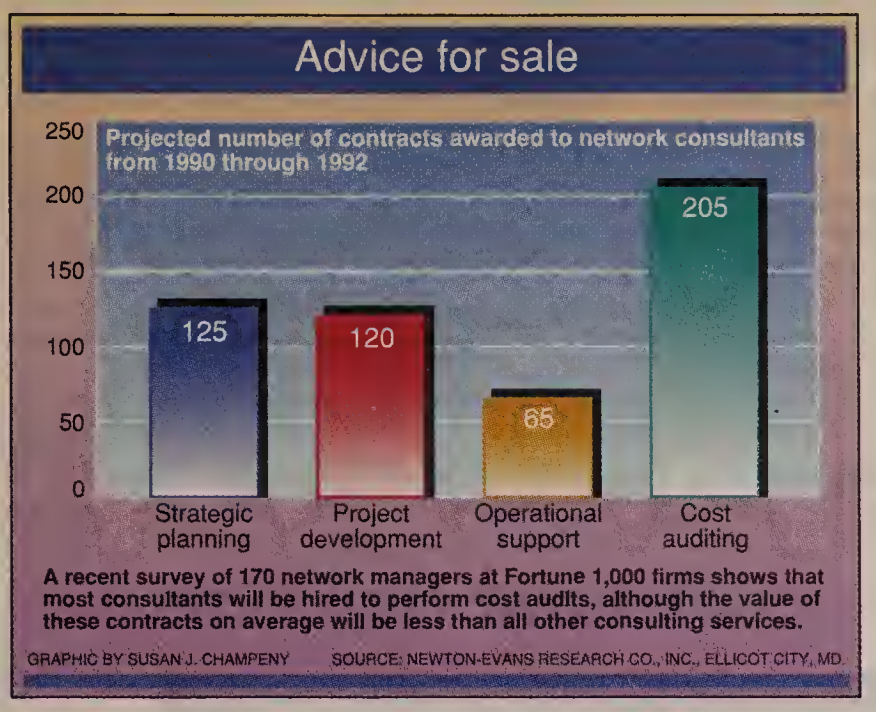
Gary Henkel
Director of telecommunications
Time Customer Service, Inc.
Tampa, Fla.

"I don't think it's a policy issue at this point. It would be tough to regulate ANI until there is some sense of how it's going to be used, and no one is really sure about that.

"My hunch is that privacy issues will not concern most people. Magazines, credit card companies and airlines already sell customer information to other companies, and consumers don't seem to mind much.

"In any case, businesses will sort out for themselves what customers are comfortable with. People will probably accept some loss of privacy to get certain services that ANI will make possible. Otherwise, the services won't survive and companies will have little motivation for offering them."

Terry Curtis
Associate professor
School of Communications
California State University at Chico



EDI trailblazers pay price for early implementation

Is it better to be late than early when using EDI?

By Wayne Eckerson
Senior Writer

In the fast-moving world of electronic data interchange, it sometimes pays to trail the pack.

Ironically, EDI pioneers — companies that began using EDI five to 10 years ago — often find it difficult to integrate EDI systems and other business applications. They also have trouble merging EDI programs implemented by different departments and operating units that use incompatible software and hardware platforms.

Newcomers to EDI often have an advantage over the pioneers because they can implement sophisticated systems, including turnkey software packages, that support standards and integrate EDI and internal applications, such as accounting, order entry, distribution and purchasing.

> Users often find it difficult to integrate EDI systems and other business applications.
>
> ▲▲▲

"Some lucky businesses can install a totally integrated system that links internal applications directly to EDI. The rest of us get hung up on old systems that are very difficult to change," said John Pendrak, EDI project manager for Westinghouse Electric Corp. in Pittsbugh.

Roger Cadaret, a principal at the management consulting firm of Ernst & Young in Detroit and a former EDI manager at General Motors Corp., said Japanese automakers that have launched new assembly plants in the U.S. have an advantage over U.S. competitors because they are free to build EDI systems from scratch.

GM's loss, Mazda's gain

Mazda Motor Corp. recently built an assembly plant in Flat Rock, Mich., near Detroit, to manufacture the Probe automobile for Ford Motor Co. Mazda officials were determined to find a way to reduce the amount of paper the company had to process on a daily basis.

Mazda implemented an EDI system that integrates EDI data directly into its internal applications. The system also supports electronic funds transfer, which is usually the last step in the integration process.

GM, on the other hand, has been using EDI for many years but has had difficulty tying together EDI systems established by different departments at the company, according to Cadaret.

The company has a decentralized structure that makes it difficult to standardize the use of software and systems in its operating units.

As a result, GM divisions don't use the same software codes and formats to refer to such things as employee social security numbers, Cadaret said. This lack of standardization makes it difficult for GM to integrate its separate EDI systems and improve the flow of information within the company.

According to Cadaret, the only way GM can circumvent this problem is to standardize software throughout the company — a strategy that undermines GM's

(continued on page 24)

Top execs: What we need from IS pros

Senior officers say they need managers who can wield technology to advance corporate cause.

By Joe Panepinto
Staff Writer

What do senior executives want from network and computer managers?

They want information systems (IS) professionals who can keep up with technological advances and can translate them into strategic business moves, according to senior executives contacted by *Network World*. These top managers voiced concerns about IS professionals who make networking decisions based on technology considerations rather than specific business goals.

The successful IS professional must be able to assess the value of new networking advances in terms of the overall corporate mission, they said, and must express their ideas in terms that are clear to top managers.

"The IS professional has an obligation to express himself or herself in ways that convey the corporate implications of an expenditure," said Jerry Walker, president of Phoenix-based Samaritan Senior Services, a nursing home and home health care company with 1,800 employees and locations in three states. "They have to put information needs or problems in terms that are relevant to things like patient information and business."

Frank Leser, president of Financial Technologies, a wholly owned data processing subsidiary of Pentagon Federal Credit Union in Chantilly, Va., said he hires IS people who are knowledgeable about the banking industry.

"We tend to hire people out of the information systems departments of banks," Leser said. "There we have found a mixture of people with a technical background and what you would call a minor on the business side."

Charles Doherty, president of the Midwest Stock Exchange, said he wants IS professionals who understand stock trading. Doherty has filled his IS department with professionals who not only keep pace with changes in network technology, but are willing to learn about the idiosyncracies of life on the trading floor.

"We started out with people in our IS departments who just knew systems," Doherty said. "But

(continued on page 24)

EXECUTIVE BRIEFS

BY WAYNE ECKERSON

Forgotten but not gone. Companies that farm out network functions and staff to an outside vendor usually expend a lot of energy trying to bolster morale and negotiate benefits of employees who are being transferred. However, these companies often overlook the needs of employees who remain with the company after many of their colleagues have exited.

According to Don St. Clair, a principal at Nolan, Norton & Co., a management consulting firm in Lexington, Mass., these employees often show a marked decline in their productivity.

These staffers, who may work in a department decimated by an outsourcing decision, question their company's commitment to information technology and believe their role in the firm has been diminished, St. Clair said.

St. Clair advised that senior executives emphasize to employees the business context of an outsourcing decision. Executives should reaffirm their commitment to information technology and impress upon employees that they play an important role in the business.

Classify your CEO. Chief executive officers come in all forms, according to Index Group, Inc., a Cambridge, Mass.-based consulting firm. Index Group has identified six types of CEOs according to the way they approach information technology, and not all of the classifications are flattering.

The "Phobic" shuns computers and believes using advanced technology dehumanizes customer service. The "Penny-pincher" takes a bottom-line view of all technology investments and often

(continued on page 24)

EDI trailblazers pay for implementation

continued from page 23

decentralized philosophy — or install expensive system interfaces.

GM officials involved with EDI declined to comment on Cadaret's evaluation.

Other large firms have a difficult time updating old applications to accommodate the document formats required by current EDI standards. Westinghouse developed much of the software it now uses to run internal applications 30 years ago, long before off-the-shelf software packages became available. While the applications serve the firm's internal needs well, they are extremely difficult to integrate with ANSI's X12 standards, the predominant EDI standards used by U.S. companies.

For example, Westinghouse's order-entry application allows users to specify one address for shipping and one address for billing per order. ANSI X12 standards, on the other hand, allow users to list multiple deliveries per order instead of just one. This means ANSI X12 provides a lot of extra addresses and shipping information that can't be easily included in Westinghouse's order-entry application.

Sometimes it takes programmers up to six months to figure out how to convert data between ANSI X12-compatible applications and Westinghouse's, Pendrak said.

"The problem resides in getting data moved from a very limited application to ANSI X12, which is very flexible, and back again," Pendrak said.

Pendrak said Westinghouse examines and decides whether to replace existing systems about every six months or so. However, the cost of purchasing new systems for the company's 50 operating units far exceeds what it takes to make minor modifications in the system. Moreover, coordinating the cutover of all 50 systems would be a nightmare, Pendrak said.

Meanwhile, EDI newcomers can purchase fully integrated software packages from a number of vendors.

For instance, Little Falls, N.J.-based Software Associates, Inc. offers an integrated EDI software package that runs on personal computers and Novell, Inc. local-area networks. The package enables users to integrate EDI directly into accounts payable, general ledger and other accounting applications. The company is also developing a similar application for use on IBM Application System/400s.

Top execs: What we need from IS pros

continued from page 23

now all our people understand trading."

Doherty has a number of in-house subcommittees that bring together IS professionals and traders so that each group can understand the limitations and needs of the other. After all, given the complexities of technology and the difficulties of managing, finding IS professionals who speak the language of both the computer and board rooms with equal fluency is extremely difficult.

A recent survey, conducted for United Research Co., Inc. by Louis Harris and Associates, Inc. in New York, showed that 60% of the corporate presidents and chief executive officers surveyed do not believe IS executives have enough general business experience to realistically evaluate new advances in networking.

That doesn't mean senior executives would rather have a manager who is savvy about their particular industries and has only incidental IS training occupying the top IS slot in their companies. Some consultants, however, suggest they consider it.

Patrick Springer, director of industry services at Telecommunications Management Consultants, a subsidiary of Computer Task Group based in Needham Heights, Mass., says some companies would do well to put a manager with a business background into the top IS slot.

"That individual approaches networking situations without preconceptions," Springer said. "They are presented with a business case and survey the market as to whom has expertise to help them."

But neither Walker nor Doherty agreed with him. "You could take the Margaret Mead approach and educate, educate your line managers in the technology," Walker said. "But companies can't wait for the gestation period. I have found that IS people are capable of expressing themselves in ways that are understandable to CEOs but are just uncomfortable doing it."

Doherty concurred. "The best way to go is to make the IS pro become the manager [rather] than to have the manager become an [IS] pro. It's not even close."

Executive Briefs

continued from page 23

forces business units to purchase computers on the sly. The "Automater" sees computers strictly as a replacement for people and vetoes innovative technology projects with difficult-to-quantify returns.

The "Hacker" is an enthusiastic user and proponent of personal computers. However, this CEO views every potential application as personal computer-based and sees mainframe systems as unwieldy and obsolete. The "Visionary" believes computers can transform jobs and business functions in powerful ways but fails to make the organizational and functional changes needed to ensure their success.

The "Informed Visionary" is Input's ideal CEO. Informed Visionaries have a strong grasp of the information flow in their businesses and understand how technology can improve that flow. They also have a long-term vision of how technology will affect their business in the future and are committed to making it happen.

Informed Visionaries don't feel compelled to cost-justify every computer project. These executives will commit resources to projects that provide significant benefits.

There's only one way to get around out here.

PC/TCP® PLUS

No matter who or what your PC needs to communicate with, there's nothing like PC/TCP Plus. It's not only the fastest, but also the most comprehensive TCP/IP implementation in the industry. And PC/TCP Plus has NFS™ access built right in.

Providing connectivity to other PCs, minicomputers and mainframes, PC/TCP Plus communicates over Ethernet, Token Ring and StarLAN networks with operating systems ranging from UNIX and VMS to VM and MVS. And you can forget hardware incompatibility; PC/TCP Plus supports the largest selection of LAN interfaces in the business.*

From around the world to around your office, now your PC can transfer files, send and receive electronic mail, emulate VT100, VT220 and IBM 3278 terminals, access NFS servers, and much, much more. VINES™ and NetWare™ users will appreciate PC/TCP's full compatibility, as will customers of Oracle's distributed PC database products. And with our Development Kit, including a Berkeley Sockets library, you have all you need to produce custom applications.

So, the next time you want to get from here to there, get PC/TCP Plus, the TCP/IP implementation that gives you a whole new perspective on network communication. Call us at (617) 246-0900 for more information.

PC/TCP is a registered trademark of FTP Software, Inc.
VINES is a trademark of Banyan Systems, Inc.
NetWare is a trademark of Novell, Inc.
NFS is a trademark of Sun Microsystems, Inc.

FTP Software, Inc.
26 Princess St.
Wakefield, MA 01880-3004
Phone: (617) 246-0900
Fax: (617) 246-0901

ftp Software, Inc.®

The most comprehensive TCP/IP implementation in the industry.

SUPPORTS NFS!

See the FAXNeT Form on Page #51

*PC/TCP Plus supports interfaces from Acer, Allied Telesis, Apricot, AT&T, BICC, DEC, D-Link, DSC, Excelan, Gateway Communications, IBM, IMC Networks, Intel, Interlan, Longshine, MCAssociates, National Semiconductor, Novell, Proteon, Schneider & Koch, Scope, 10Net, 3Com, Tiara, Torus, TRW, Ungermann-Bass, Univation, Western Digital and YCS, in addition to the NDIS and Packet Driver specifications.

Just three years ago, Compaq fired the shot heard around the world.

Now for the

In September 1986, Compaq introduced a personal computer that changed people's ideas about what a PC could do.

The COMPAQ DESKPRO 386 Personal Computer was the first PC based on the powerful 386 microprocessor. It gave people the speed and power to do more than ever before. It pushed out the envelope of technology. But did it in a way that let users continue to work with industry-standard software and hardware. With it, Compaq set a new standard in PC performance.

Compaq has done it again.

Introducing the COMPAQ DESKPRO 486/25 Personal Computer and COMPAQ SYSTEMPRO Personal Computer System.

Once again, Compaq has expanded the role of the PC—to meet the most demanding needs of both single and multiple users. And once again, Compaq has pushed out the envelope of technology to deliver new levels of performance and expandability, without sacrificing compatibility.

sonic boom.

These new computers were designed from a simple observation: People use computers differently. One user using a PC has different needs than a group working together on a network or multiuser system.

The COMPAQ DESKPRO 486/25 is for the individual whose job depends on a PC. It was designed from the ground up to unleash the power of the evolutionary new Intel 25-MHz 486 microprocessor.

The COMPAQ SYSTEMPRO delivers an unprecedented combination of system performance and expandability to networks and multiuser systems. Its breakthrough design gives users the flexibility to work with both 33-MHz 386 and future 33-MHz 486 technology. It also provides the unmatched capability to work with multiple processors.

Inside both you'll find advances like cache memory designs that boost processor performance. Extended Industry Standard Architecture *(Extended ISA* or *EISA)* that accelerates input/output performance while maintaining compatibility. New drive and controller technology that increases fixed disk performance and reliability. And that's just the beginning of this story.

When it comes to performance, we believe actions speak louder than words.

Since we introduced our first personal computer in 1983, no other computer company has delivered PCs with the technical excellence of COMPAQ PCs.

Today Compaq offers a full line of high-performance personal computers. Desktops based on 286, 386 and now 486 processor technology. Portables and laptops. And our new PC system, customized for multiple users.

In every COMPAQ personal computer you'll find innovative technology. Along with plenty of common sense. Like the ability to run the world's largest library of industry-standard software. And the room to add the peripherals your job demands.

This combination of technical leadership and practical thinking is why COMPAQ PCs consistently earn the highest marks for quality from computer experts. And unsurpassed marks for satisfaction from users.

Standing behind every COMPAQ PC is a worldwide network of Authorized COMPAQ Computer Dealers. Your dealer is trained to help you build powerful computing solutions. For the location of your nearest dealer and free information, call 1-800-231-0900, Operator 107. In Canada, 1-800-263-5868, Operator 107.

COMPAQ

It simply works better.

COMPAQ, DESKPRO, Registered U.S. Patent and Trademark Office. SYSTEMPRO is a trademark of Compaq Computer Corporation. Product names mentioned herein may be trademark and/or registered trademarks of other companies. Units available for sale will comply with applicable FCC Rules and Regulations. ©1989 Compaq Computer Corporation. All rights reserve

Worth Noting

MCI Communications Corp. recently extended its international operator service, MCI Call USA, to Japan, Taiwan and 14 cities in Italy. Callers using the service dial toll-free numbers to reach English-speaking MCI operators, who then help them complete collect or charge calls.

World News

AT&T last week lowered prices for transmissions to 12 countries over its **International Accunet Packet Service.** The cost of X.25 transmissions to Austria, Denmark, Finland, France, Iceland, Ireland, Italy, New Zealand, Norway, Spain, Sweden and Switzerland using this service is now $6 per hour plus $6 per 64K bytes of data, or kilosegment. This is down from $8 per hour and $10 per kilosegment.

To these rates, users must add local access charges in the U.S. and local access charges in the receiving country.

Infonet, the El Segundo, Calif.-based international value-added network (VAN) service provider, last week announced that it now supports X.400-based electronic mail transmission services and it plans to sell X.400 E-mail software for 3Com Corp. and Novell, Inc. local-area networks within six months.

In addition, the company announced that it plans to interconnect its international VAN service via X.400 with E-mail networks run by AT&T and MCI Communications Corp.

A spokesman said that X.400 transmissions over the Infonet network cost about twice as much as standard X.25 transmissions. Infonet's Notice 400 PC X.400 software for personal computers, which was also introduced, costs $350.

Global users eye proposed trans-Soviet fiber link plan

Execs weigh pros, cons of Europe-to-Asia cable.

By Joe Panepinto
Staff Writer

DENVER — Large international network users in the U.S. are assessing the potential benefits of a proposed trans-Soviet fiber-optic cable linking Europe and Japan.

Brokerage firms with heavy international voice and data traffic told *Network World* they would welcome the direct Europe-to-Asia link proposed by a consortium of 10 international telecommunications companies led by US West International, Inc. a subsidiary of US West, Inc. based here. But users said it is not likely they will restructure their networks to exploit it.

A trans-Soviet fiber link would be another option for high-speed, high-quality worldwide transmission. But users say they are already seeing a glut in international capacity, thanks in large part to a number of new undersea fiber links ("Undersea fiber cables to herald low int'l rates," *NW,* Aug. 28, 1989). They said they are satisfied with the quality of service provided by existing terrestrial and satellite links.

The 560M bit/sec fiber-optic link proposed by the US West-led Trans-Soviet Line Development Corp. (TSLD), would roughly follow the course of the trans-Siberian railroad, from Vladivostok, Russia, on the Sea of Japan, west across the Soviet Union to Moscow and then in branches to Palermo, Italy, and Copenhagen, Denmark (see graphic, page 26).

Thus, the primary beneficiaries of the more than 7,000 miles of fiber will be large European and Asian users that need to communicate with one another, and the Soviet Union, which will use the fiber link for domestic long-distance traffic.

Although U.S. firms would not access the proposed line directly, international traffic from other networks may be routed through the Soviet Union.

"It would allow a firm to have backup fiber capabilities to get to Asia from the U.S.," said Michael Flanagan, vice-president and director of communications services at Nomura Computer Systems, Inc., a New York subsidiary of Nomura Securties Co., Ltd., the largest securities firm in world.

Nomura routes its U.S.-to-Tokyo voice and data traffic over the undersea Trans-Pacific Cable-

(continued on page 26)

Mattel's mix of VSAT and terrestrial links makes for a winning approach to delivering voice and data to distribution and manufacturing sites in Europe and the Far East from its Phoenix data center and Hawthorne, Calif., headquarters.

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: MATTEL CORP., HAWTHORNE

Mattel net simplifies production, cuts costs

International network of VSATs and leased lines lets firm pare a month off toy design process.

By Paul Desmond
Senior Writer

HAWTHORNE, Calif. — After installing an international VSAT network 18 months ago, Mattel, Inc. has cut nearly a month off its toy production cycle and slashed its global voice and data communications costs by millions.

Mattel uses a combination of very small aperture terminals and leased lines to reach sales, distribution and manufacturing sites in the U.K., Hong Kong and Italy from its headquarters here and its Phoenix data center. In addition to cutting costs, the network has enabled product designers here and in the Far East to quickly exchange and modify product designs — a time-consuming process that once required couriers.

But installing an international net can be a long and arduous process, said Ron Wagner, Mattel's telecommunications manager. With the right blend of technique and expertise in dealing with foreign carriers, however, users can overcome the roadblocks.

Overseas, Mattel has VSATs at its sites in Hong Kong; Leicester, England; and Novara, Italy — each of which supports a 56K bit/sec satellite link to a Contel ASC shared hub in San Francisco. Domestically, the company has VSATs at sites in City of Industry, Calif., Fort Worth, Texas, and Toronto. These sites are supported by an earth station at its Phoenix data center. A single T-1 line connects the data center with the San Francisco hub.

From its VSAT sites in England and Hong Kong, Mattel uses a mix of terrestrial lines, satellite and microwave to reach its sales, distribution and manufacturing locations in surrounding areas.

The network, which went up in 1988, is expected to save the company $4.2 million by 1992, compared to what Mattel paid for the store-and-forward public packet network service it previously used.

The satellite net supports interactive data communications and four channels of voice to each overseas VSAT site, enough to support about 40% of Mattel's international voice communications needs, Wagner said.

Voice is supported using Republic Telcom Systems Corp.'s RLX 8 packetized voice and data multiplexer. The RLX 8 uses a proprietary compression algorithm that allows Mattel to support four voice channels with only 32K bit/sec of bandwidth, or 8K bit/sec for each voice call.

"[The RLX 8] reduces our annual costs by about $100,000," Wagner said. "We no longer have to use the international dial-direct operator for about 40% of our calls because we have four channels of voice to Hong Kong, the U.K. and Toronto."

The network has also made data communications easier and faster since it is no longer a store-and-forward system, which often required follow-up phone calls to

(continued on page 26)

Net helps police investigate Pan Am Flight 103 disaster

By Joe Panepinto
Staff Writer

LOCKERBIE, Scotland — A network linking major police agencies around the globe and constables in this tiny Scottish town is playing a major role in the investigation into the December 1988 bombing of Pan American World Airways, Inc. Flight 103.

Investigators throughout the world are funneling information about suspects and extremist groups into a data base maintained on a minicomputer here, where 18 constables, each working 12 hours a day, match the data with evidence from the Flight 103 bombing.

"It's really a fascinating use of networking," said Sally Olson-Nelson, director of marketing at EAI Systems, Inc., a public safety software company in Clearwater, Fla., which will market in the U.S. software developed for the Lockerbie investigation. "It has really helped them put together their crime scene."

A McDonnell Douglas Computer Systems Co. (MDDCS) System 1900 minicomputer housed in a converted community school here supports the data base and more than 30 terminals used by investigators.

Agents at the Federal Bureau of Investigation's field office in Buzzards Point, Md., and investigators of the Bundeskriminalamt, the West German federal police in Meckenheim, West Germany, also have access to the data base via the Tymnet public data network.

Investigators using terminals at the Scottish police headquarters in Glasgow, Scotland, and at Scotland Yard in London are linked over dedicated circuits to Lockerbie.

The System 1900 has almost 8G bytes of storage capacity and is being driven by software written expressly for the Lockerbie investigation by MDDCS in the U.K., according to Stephen Cole, branch manager of police systems at MDDCS in the U.K.

"It's a system for investigating major incidents and for the iden-

(continued on page 56)

Global users eye trans-Soviet link

continued from page 25

3/Hawaii-4 fiber link and its U.S.-to-Europe traffic through Trans-Atlantic Telecommunications 8 and Private Trans-Atlantic Telecommunications fiber links.

Achin Dasgupta, vice-president of international telecommunications at Shearson Lehman Hutton, Inc. in New York, said he would like to see the cable cut over because it would increase the number of international fiber routes, diminishing the impact of physical cable disruptions.

Shearson Lehman Hutton currently uses the same international fiber routes as Nomura.

In a meeting in Tokyo next week, US West is hoping to hammer out details of the proposal with TSLD principals: Kokusai

(continued on page 56)

Net simplifies production

continued from page 25

inform end users that data was waiting.

The company developed software that packetizes two-dimensional product design images for transmission across the network. The software runs on the IBM System/38 and Application System/400 minicomputers Mattel uses at some 20 sites worldwide.

Product designers use computer-aided design software on a personal computer and upload the design to a minicomputer when it is ready for transmission. Once received at manufacturing sites in the Far East, the design is downloaded to another personal computer, then checked for accuracy and for any needed revisions. The revised version may have to be shipped back to headquarters for verification, all of which takes about a day, Wagner said.

In contrast, the same process took 30 days before the network was in place because designs were shipped by courier and subject to lengthy delays by various customs departments. Occasionally, designs were lost altogether.

The benefits of the international network did not come easy though. Wagner said it was often difficult dealing with foreign post, telegraph and telephone administrations because they were sometimes not as technically astute as carriers in the U.S. He offered some tips for network managers charged with installing international networks.

"If you're not familiar with what's available in each country, become familiar by writing letters," Wagner said. "Get a single point of contact [at each foreign PTT]. Ask what it is they provide. Ask what you can do to help educate them."

If users are tactful and clearly convey their objectives, foreign PTTs can be receptive to new ideas that will help them improve service. For example, when Wagner needed to upgrade a digital microwave link from 9.6K bit/sec to 19.2K bit/sec between Hong Kong and Kuala Lumpur, Malaysia, the PTT in Hong Kong told him it couldn't be done.

Wagner then visited the PTT and detailed what kind of modem and multiplexing equipment could be installed to upgrade the microwave link.

"The circuit was indeed upgraded and installed successfully," he said. "They are now selling 19.2K services from Hong Kong to Malaysia since we installed the circuit."

For users who don't have the time or money to visit foreign countries themselves, Wagner recommends they find a consultant who is willing to do so. Users should make sure the consultant is familiar with each country involved in the project and is willing to see it through from conception to reality, he said.

To Handle Tomorrow's High Data Speeds, Use Plenum Cable Insulated With Teflon® Today.

Soon, your system is going to run at higher data rates. But if your twisted pair cable isn't built for speed, you'll get bogged down with "jitter"—fluctuations in timing of network signals. That can lead to increased bit error rate, system slowdown, and cable obsolescence. Unless you install plenum cable made with TEFLON® fluorocarbon resin.

Thanks to a low dielectric constant of 2.1—the lowest of any insulation—TEFLON reduces problems like attenuation that can lead to cable jitter. In fact, tests show that cables insulated with TEFLON offer superior performance compared to PVC and other materials.

And that means reliable data transmission and longer cable runs, whether you're running at 10 megabits today or 20 megabits or more with your next generation system.

What's more, cable made with TEFLON also cuts installation costs by 50% because it meets building codes without conduit.

Today, when you specify cable for your system, make sure it says "Insulated with 100% Du Pont TEFLON® Fluorocarbon Resin" right on the label. And be ready to run at higher transmission speeds tomorrow.

Call 1-800-992-0412, ext. 3200, or write for our free brochure on twisted pair cable for high-speed networks: Du Pont Company, 595 Colonial Park Drive, Roswell, GA 30075.

INSULATED WITH 100% DU PONT TEFLON® FLUOROCARBON RESIN

DUPONT

PRODUCTS & SERVICES

THE LATEST OFFERINGS FROM VENDORS AND CARRIERS

First Look

NCD adds color model to X/Windows family

Network Computing Devices, Inc. (NCD) will introduce this week an X/Windows terminal that supports up to 256 colors simultaneously on a 17-in. screen.

The **NCD17c** complements the company's existing monochrome X/Windows terminals — the NCD16 and NCD19 — which have 16-in. and 19-in. screens, respectively. X/Windows is a graphical user interface standard for network workstations.

Featuring 1,024 pixel-by-768 pixel resolution, the NCD17c uses the X/Windows System to provide a workstation-style interface to a variety of net-attached host computers.

The NCD17c is based on a 20-MHz Motorola Corp. 68020 microprocessor and two custom graphics chips.

The terminal supports 256 simultaneously displayable colors, making the product well suited for applications such as business graphics, desktop publishing and computer-aided design and manufacturing, the company said.

Fully compatible with NCD's NCDware software, which runs on the entire NCD X/Windows terminal line, the NCD17c supports Ethernet and thin Ethernet with Transmission Control Protocol/Internet Protocol and optional concurrent Digital Equipment Corp. DECnet protocols. This allows the terminal to simultaneously access X/Windows and DECwindows applications from hosts running Unix, as well as DEC's VMS and Ultrix.

NCDware, NCD's optimized version of X/Windows' X.11 software, supports Telnet terminal emulation and TCP/IP's Trivial File Transfer Protocol, a simplified version of the File Transfer Protocol that enables the terminal to maintain higher performance. NCD17c also supports Sun Microsystems, Inc.'s Network File System for font selection over the net.

Available 60 days after receipt of order, the NCD17c is priced at $5,000. TCP/IP protocols cost an additional $50, while TCP/IP and DECnet cost $200.

Network Computing Devices, Inc., 350 N. Bernardo Ave., Mountain View, Calif. 94043; (415) 694-0650.

(continued on page 29)

Hayes' ISDN interface for PCs integrates voice, data

BRI adapter supports range of configurations.

By Tom Smith
New Products Editor

ATLANTA — Hayes Microcomputer Products, Inc. recently introduced an Integrated Services Digital Network Basic Rate Interface (BRI) adapter for IBM Personal Computers.

The interface, dubbed the Hayes ISDN PC Adapter, will enable Personal Computers to access the two 64K bit/sec bearer channels and the 16K bit/sec signaling channel within a single BRI telephone line.

> Hayes pledged to develop software that will support additional switches.
>
> ▲▲▲

The card can be used with services provided by Northern Telecom, Inc. DMS-100 and AT&T 5ESS central office switches and their implementations of CCITT Q.931/I.451, which provides signaling and call control, and CCITT Q.921/I.441, which provides error control. The adapter supports ISDN's ANSI V.120 standard for rate adaption and X.25 packet-switched data on the B or D channel.

Hayes pledged to develop software that will support additional switches and switch enhancements as the market develops.

As released, the Hayes interface will support a range of configurations, including:

- One B voice channel, one B packet-switched data channel and packet switching on the D channel. (This configuration is not available on 5ESS switches running AT&T's Software Generic Version 4.2 software.)
- One B voice channel, one B circuit-switched data channel and packet switching on the D channel.
- One B voice channel and one B packet-switched data channel.
- One B voice channel and one B

(continued on page 28)

E-mail pack uses NetWare's message-handling system

SCARBOROUGH, Ontario — PC Comnet, Inc. recently introduced an electronic mail package for Novell, Inc. NetWare local-area networks that takes advantage of NetWare's built-in mail-handling capabilities.

The software, called Mail, consists of both server and workstation modules. The workstation portion is used to compose messages, while the portion on the server routes them to their recipient.

One of its principal advantages over competing E-mail systems is that it interfaces with NetWare's "bindery," the operating system level at which network administrators establish user accounts and set security clearances for individual users. With Mail, users' E-mail accounts are created simultaneously with their NetWare accounts.

Other packages, by contrast, require administrators to create E-mail accounts for individual users after creating similar accounts for NetWare users, thus duplicating their efforts.

Mail takes advantage of NetWare's built-in message-handling system, which is designed for message routing, according to Mario Pintaric, director of research and development at PC Comnet. Other packages require separate mail directories.

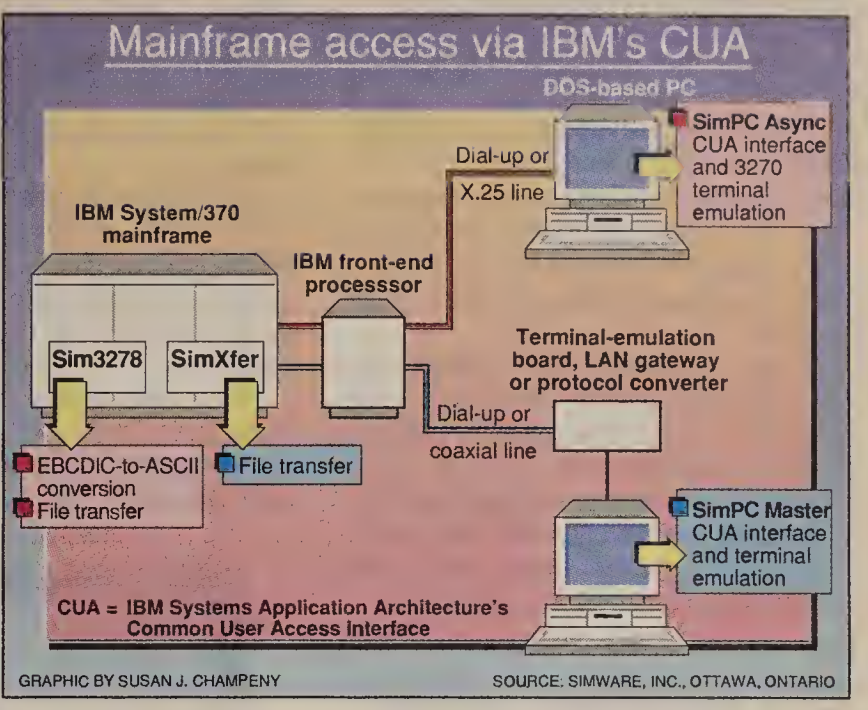
"It's rather curious that other vendors are not taking advantage of this feature," Pintaric said. "In essence, the message-handling system is set up in a manner very akin to the way real mail is delivered."

Mail utilizes the individual users' mailboxes in NetWare. This assures a greater level of security and privacy than centralized E-mail systems, which route all messages to a single location from which they must be retrieved. It also limits the chance that any problem affecting an individual user's messages could affect all E-mail files.

Messaging options

Under the Mail program, users have three options for the types of messages they can create: memo pads, memos and letters. Memo pads are similar to telephone messages and include basic information such as the name of someone who called, when

(continued on page 28)



CUA interface added to emulation package

Simware's latest SimPC emulator complies with IBM's Common User Access interface in SAA.

By Tom Smith
New Products Editor

OTTAWA — Simware, Inc. recently upgraded its personal computer 3270 terminal emulation software to comply with the Common User Access (CUA) interface within IBM's Systems Application Architecture (SAA).

CUA defines the user interface for applications under SAA. IBM is using SAA to develop applications that can run across a range of its processors, including Personal Computers, minicomputers and mainframes.

Simware's product, SimPC 5.0, lets personal computer users establish a 3270 session with an IBM System/370 mainframe using the standard CUA interface. The earlier release, SimPC 4.4, used a proprietary and less user-friendly interface, according to Bill Stewart, Simware's workstation product manager.

"We recognize that SAA is going to be an absolute requirement when people come to look for a product in the future," Stewart said. The company worked with existing customers for eight months to determine user interface requirements.

SimPC 5.0 is available in two versions: SimPC Async, which is designed for personal computers communicating with a host asynchronously or via an X.25 link; and SimPC Master, which can be used with a variety of communications hardware for transmissions over asynchronous, X.25 or coaxial cable.

Both versions work in conjunction with a complementary Simware mainframe-based software package. SimPC Async works with Sim3278, which performs EBCDIC-to-ASCII conversion and provides file transfer. SimPC Master works with SimXfer, a file-transfer program, while protocol conversion is performed by terminal emulation boards, local-area network gateways or protocol converters.

In addition to providing 3270 terminal emulation, both versions of SimPC 5.0 provide Digital Equipment Corp. VT-100 and teletypewriter terminal emulation for users who need to access local DEC VAXes or services such as the Dow Jones Information Service Group's Dow Jones News/Retrieval Service, Stewart said.

> "SAA is going to be a requirement when people look for a product in the future."
>
> ▲▲▲

The principal enhancement of Version 5.0 over SimPC 4.4 is CUA compatibility. The earlier SimPC interface required users to manually enter data, while the new interface enables users to choose from a list of options in a menu. CUA also provides for standardized function keys, so the same keys initiate the same functions, regardless of the application.

Support for CUA could be a boon to Simware if SAA gains wide acceptance, according to David Passmore, a partner with Network Strategies, a network

(continued on page 28)

E-mail pack uses message handling

continued from page 27

they called and the message. Memos are similar, but they include a subject heading and information about when and by whom the memo was composed.

Both memo pads and memos are created before the recipient's name is entered. Basic information, such as the person creating the message and when it was created, is automatically entered by the software for both types of messages, Pintaric explained.

With letters, users input a subject and a key word so recipients know basic information about the message before reading it. They also input the receiving party's identification before sending the message.

Mail takes advantage of NetWare's built-in capability to notify users when a message has been received.

Some programs, conversely, require a terminate-and-stay-resident program on the recipient's workstation to monitor the central mail directory for messages. Such programs absorb both memory and processing cycles.

Users can attach ASCII files in E-mail messages, but the product does not currently support any third-party file attachments.

Mail is a nonresident program compatible with NetWare 2.0a and above as well as DOS 2.0 and above.

Mail is available now for $295 for a single-server copy, and site licenses are also available.

For further information, write to PC Comnet at 21 Progress Court, Unit 14, Scarborough, Ont., Canada M1G 3T8, or call (416) 289-1331.

Hayes' ISDN interface integrates voice, data

continued from page 27

circuit-switched data channel.

■ Packet-switched data on one B channel and packet-switched data on the D channel (only on the DMS-100 switch).

The adapter supports serial data, via the Hayes Standard AT Command Set Enhanced for ISDN, at rates up to 38.4K bit/sec, allowing customers to maintain existing data communications programs.

The card supports several ISDN voice services, such as Incoming Calling Line Identification, by generating messages that telephone company switches require to activate such features.

Customers will be able to tailor applications to the interface using Hayes' programmer's guide for its ISDN Basic I/O System (ISDNBIOS) Interface, which is based on IBM's Network Basic I/O System.

Applications can achieve data transfer rates of about 50K bit/sec, but overhead associated with the V.120 protocol prevents users from realizing data transfer rates of 64K bit/sec.

The adapter's software component is uploaded to random-access memory by the personal computer at installation. This simplifies upgrades to address changes and future enhancements.

The Hayes ISDN PC Adapter will be available in North America in mid-1990 for $1,600. Documentation for ISDNBIOS costs $125 and is available now.

Hayes can be reached by writing to P.O. Box 105023, Atlanta, Ga. 30348, or by calling (404) 449-8791.

CUA interface added to emulation package

continued from page 27

consulting practice of Ernst & Young in Fairfax, Va.

"If people get used to the look and feel of SAA windowing and [the CUA] interface, there will be some benefits in terms of training to have products that all support the same interface," he said.

In addition to implementing CUA, Simware has taken the user interface standard one step further by enhancing its text mode to support some of the capabilities under CUA's graphics mode. For example, users without powerful graphics workstations can still receive pop-up menus in text mode, Stewart said.

SimPC 5.0 also comes with prewritten Connector scripts for functions such as host access and file transfers.

▲▲▲

SimPC 5.0, like its predecessor, has a proprietary language, known as Advantage, which supports scripts to automate tasks that otherwise require entry of a series of commands.

However, SimPC 5.0 also comes with prewritten Connector scripts for functions such as host access and file transfers, which require minimal customization. "Rather than having to write a script from scratch, they have 80% to 90% of the code already written for them," Stewart said.

SimPC 5.0 is available now. It requires DOS 2.0 or above.

SimPC Async costs $265 for a single copy, $9,275 for a 50-copy site license and $92,750 for a 1,000-copy site license. SimPC Master is priced at $340 for a single copy, $11,900 for a 50-copy site license and $119,000 for a 1,000-copy site license.

SimXfer costs $9,000 to $15,000, and Sim3278 costs $10,000 to $20,000. Pricing for both packages depends on the mainframe on which they run.

Simware can be reached by writing to 20 Colonnade Road, Ottawa, Ont., Canada K2E 7M6, or by calling (613) 727-1779.

Racal-Milgo announces net mgmt. system for modems and CSU/DSU

Software allows IBM PS/2 users to monitor, diagnose devices.

By Tom Smith
New Products Editor

SUNRISE, Fla. — Racal-Milgo recently introduced an IBM Personal System/2-based net management system for its line of V.32 modems and its RM 3500 channel service unit/data service unit (CSU/DSU).

The software product, the Communications Management Series (CMS) 905 Dial Management System, enables users to monitor, diagnose, gather alarms, test and configure up to one million devices.

The software manages the company's previously announced Racal-Milgo Dial (RMD) 3222 V.32 modems and the RM 3500, a CSU/DSU that supports digital communications at speeds from 2,400 to 9.6K bit/sec.

When users first log onto the system, which can be linked to a single device or a rack of devices, they receive a menu screen with options including alarms, monitoring and diagnostics.

With the alarm option, users can view a list of error conditions, such as packets transmitted with errors, for individual modems and CSU/DSUs. Alarms are stored on hard disk in sequential order for audit trail or historical report generation. The 905 system maintains and updates a log of unresolved problems.

The system also allows users to run analog and digital loop-back tests, self tests, remote tests and measure analog parameters to identify line and device problems.

When users select the monitor option, they receive eight different windows that display information for different parameters, such as data rate, packet size and error rates.

Users can simultaneously observe the eight windows for each of two modems on the same screen, with the Personal System/2 screen split into halves.

When viewing the configuration of any modem, users can alter settings on the screen without interrupting operation.

With the alarm option, users view a list of error conditions.

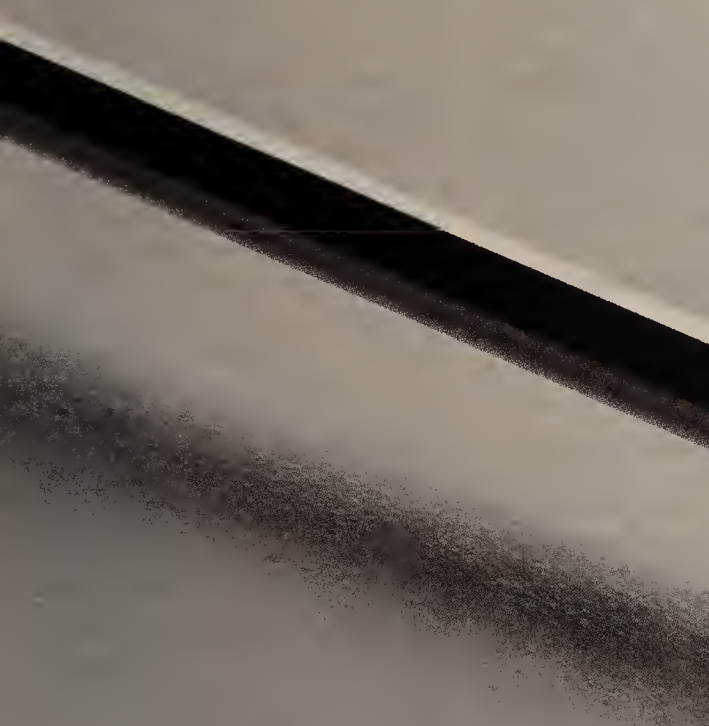
▲▲▲

Modem configurations can be downloaded to any modem on the network based, for example, on configuration requirements for time of day, peak or off-peak usage, and day of the week.

The CMS 905 will be available in mid-February and will cost $2,500.

Racal-Milgo can be reached by writing to 1601 N. Harrison Pkwy., Sunrise, Fla. 33323-2899, or by calling (305) 846-1601.

For those who think this is all there is to IBM Service, we'd like to adjust your thinking.



IBM has built a solid reputation as maintenance experts. Now we've expanded our services beyond maintenance. We even include services for your non-IBM equipment.

We will take care of all your needs. From hardware and software integration to data center design to value added network services.

For instance, we'll move your data processing system 2,000 feet or 2,000 miles. And we'll be with you from pre-planning to post-move testing. It's all part of IBM Customized Operational Services.

And because no business can afford downtime, IBM is there with Network Support, too. We'll reduce the likelihood of downtime, and work quickly to bring you back up if it does occur.

What's more, if you have a question or problem with any of your systems, specialists are available 24 hours a day, 7 days a week.

If you'd like further information, we would be happy to send you some literature. Just call 1 800 IBM-2468, ext. 133.

IBM Service. You'll find out it's really much more than you think.

IBM®

First Look

continued from page 27

CrossComm unveils service to track bridge alarms

CrossComm Corp. last week announced a service to monitor customers' ILAN bridge networks from its headquarters in Marlborough, Mass.

The service, **ExpertWatch,** is intended to relieve users of the burden and expense of continuously monitoring their ILAN bridges, which link both Ethernet and token-ring local-area networks over wide-area links.

The company has installed more than 1,000 ILAN bridges since the product was introduced two years ago.

The service was made possible through the addition of an internal 2,400 bit/sec modem to the ILAN bridge, as well as introduction of Remote ILAN Management Software (RIMS) software. That software runs on an IBM Personal Computer AT and communicates with ILAN Management Software (IMS), the only product CrossComm previously offered to manage ILAN bridge networks.

IMS communicates with each ILAN in 10- to 12-second intervals, collecting statistics and information on operating status. IMS software will notify the CrossComm Support Center, which will be operational 24 hours a day, seven days a week, if there is an alarm or error condition, such as packets dropped.

CrossComm will respond to the problem within an hour. System adjustments, reconfigurations and maintenance can be either recommended or performed over the phone line. If an ILAN unit fails, it can either be replaced with an on-site spare or replacement units will be shipped overnight.

The company also introduced RIMS-PC, a personal computer program that enables users to set up their own remote management stations at locations other than the IMS site.

ExpertWatch and RIMS-PC will be available Feb. 1 and will be demonstrated at Communication Networks '90 in Washington, D.C.

ExpertWatch costs $100 per ILAN per month, while RIMS-PC costs $1,295.

CrossComm Corp., 133 East Main St., Marlborough, Mass. 01752; (508) 481-4060.

OPINIONS

NETWORK MANAGEMENT

BY DAVID CRAWFORD

The network manager's foresight saga

Three qualities characterize the successful data network manager: a solid technical background, good communication skills and the ability to foresee the future. Of these qualities, the last is the most important.

A network manager must make intelligent choices between competing standards and products that often are not fully developed and sometimes are entirely nonexistent. More than any other computer professional, the network manager lives and breathes in the rarefied upper reaches of vaporware.

Most people consider the knowledge of things to come a mystical inborn talent. However, this simply isn't true. Clairvoyance has its own technology and can be mastered through study and practice. It's absurd to think that someone who understands networking should be baffled by something as simple as foretelling the future. Here is a survey of the state of the art in prognostication with some practical applications from the everyday life of a network manager.

> A good crystal ball is still far less expensive than a protocol analyzer and easier to use.
>
> ▲▲▲

■ **The I-Ching.** This ancient Chinese method is based on 64 symbols called hexagrams, each of which consists of six horizontal lines that are either broken (yin) or solid (yang).

To prophesy the future of Microsoft Corp.'s OS/2 LAN Manager, for example, randomly select a hexagram and consider its oracular meaning. Ta Yu, the hexagram of great wealth, symbol of the weak attaining a grand central position, would show that Microsoft Chairman Bill Gates will become the majority stockholder of IBM and still have enough pocket change to buy Apple Computer, Inc. and Digital Equipment Corp. Conversely, P'i, the hexagram of adversity, symbol of the disunion of heaven and earth, would indicate that Microsoft will be mysteriously swallowed up by Novell, Inc. during the next lunar eclipse.

■ **Tarot cards.** The Tarot deck has four suits of 14 cards each, plus 22 major trump cards bearing symbolic names and pictures. To see the future with the Tarot deck, formulate a question, shuffle, then deal a few cards face up in a layout.

Suppose, for example, you inquired about the future of internetworking protocols. If your Tarot layout contained "The World" card next to "The Chariot" card, then you would infer that the international Open Systems Interconnection protocols will take a long ocean voyage and establish themselves on our shores. "The Sun" adjacent to "The Magician" would mean that Transmission Control Protocol/Internet Protocol proponent Sun Microsystems, Inc. will be acquired by a tall dark stranger.

■ **A crystal ball.** This time-honored method of divination requires a larger investment in hardware than either the I-Ching or the Tarot deck, but it is well worth it. A good crystal ball is still far less expensive than a protocol analyzer and quite a bit easier to use.

To forecast the future of data networking, just stare into the crystal ball and all will be revealed. Curiously though, the last time I tried this, I had a recursive vision: I saw all the other network managers in the country staring into their crystal balls too. It struck me then that we are creating the future even as we attempt to envision it. If enough network managers believe that the future lies with a particular product or standard, then that prophecy will fulfill itself. This vision was not what I had expected; like a protocol analyzer, a crystal ball may tell you more than you really want to know.

Crawford is network coordinator at California State University in Northbridge, Calif.

NETWORK WORLD
The Newsweekly of User Networking Strategies

Editor
John Gallant

Executive Editor
John Dix

Assistant Managing Editor — News
Charles Bruno

Senior Editors
Industry Update — Bob Brown
Data Communications — Jim Brown
International Networking — Barton Crockett
Local Networking — Laura DiDio
Telecommunications — Bob Wallace

Senior Writers
Paul Desmond
Management Strategies — Wayne Eckerson

Staff Writer
Joe Panepinto

New Products Editor
Tom Smith

Assistant to the Editor
Cheryl Tynan

Network World
161 Worcester Road
Framingham, Mass. 01701
(508) 875-6400
MCI Mail — 390-4868

An IDG Communications Publication

Assistant Managing Editor — Production
Beth Khoury

Associate Editor
Joanne Cummings

Copy Editors
Liz Pappas
Michelle Beaulieu
Karen Maierhofer

West Coast Bureau
501 Second Street, Suite 600
San Francisco, Calif. 94107
(415) 978-3160

Bureau Chief
Susan Breidenbach

West Coast Correspondent
Walter Sweet

Washington, D.C. Bureau
650 National Press Building
529 14th Street NW
Washington, D.C. 20045

Bureau Chief
Anita Taff
(202) 347-6184

Washington Correspondent
Gail Runnoe
(202) 347-4180

Features Editor
Steve Moore

Associate Features Editor
Bruce Guptill

Features Writer
Salvatore Salamone

Assistant Features Editors
Alison Conliffe
Susan Collins

Art Director
Dianne Barrett

Informational Graphics Designer
Susan Champeny

Junior Graphic Designer
Susan Slater

Contributing Editors
Daniel Briere
James Kobielus
Joe Mohen
Alan Pearce

Editorial Assistant
Tracie Seder

President/Publisher
Gary J. Beach

Director of Financial Operations
Mary Fanning

EDITORIAL

Avoid grumbling in the ranks by soliciting staff input

Network managers often run into trouble because they neglect to consider the impact a major decision — such as a commitment to farm out network operations to an outside vendor or to bring in an outside consultant or systems integrator — might have on their staff. Then when morale and productivity plummet and workers begin resigning, they wonder why their best laid plans went awry.

Consider Merrill Lynch & Co., Inc. Last month, its top information systems executives backed away from their plan to transfer about 50 employees to IBM and MCI Communications Corp. as part of a network management outsourcing agreement announced last September.

The decision to farm out network management functions created confusion and animosity among staffers who thought the company was treating them unfairly. The uproar caught senior officials off-guard, forcing them to spend time resolving employee problems instead of moving ahead with their project.

Unfortunately, such disasters are not uncommon. Swamped with duties that demand immediate attention, such as budgets, vendor negotiations and new products, network managers often forget to consider the needs of their employees. Moreover, most network managers rise through the technical ranks and lack the people skills necessary to be effective managers.

Yet network managers who fail to tune in to their employees put all their hard work and projects at risk. Managers who neglect their employees will have employees that neglect their jobs. When this happens, network performance begins to erode and the manager's credibility with both top management and staff is undermined.

Fortunately, good management relies on a few commonsense principles that most people know by instinct and can apply without much effort.

> Network managers who fail to tune in to their employees put all their hard work and projects at risk.
>
> ▲▲▲

One principle is that managers should value the opinions of their workers. Primarily, this means managers should *listen* to employees instead of telling them what to do.

Managers who listen to employees often uncover a wealth of information about how to improve network performance or cut costs. For example, the financial services firm Drexel Burnham Lambert, Inc. trimmed more than $60 million from its data processing and communications budget during the last three years largely by soliciting cost-cutting suggestions from employees working in front-line jobs. When information flows from the bottom up instead of the reverse, managers find that employees are more productive and content.

Another principle is that employees need to be recognized. In a recent survey, almost one-third of the respondents said they would quit their jobs to work for a company that gave more recognition and praise to its employees, even without an increase in salary.

When Eastman Kodak Co. announced it would farm out data processing and network operations to outside vendors last year, senior officials took great pains to reassure employees they had done outstanding work and they weren't a factor in the company's decision.

The company also backed up its commitment to workers by guaranteeing that their retirement benefits and salary would be maintained if they were transferred to the vendor company.

Managing employees takes considerable time, energy and money, but it's critical to achieving success. Network managers would make fewer bad decisions and enhance worker satisfaction and productivity if they remembered the cardinal rule of management: People are the most valuable resource.

OPINIONS

SNA

BY JOE MOHEN

Quality assurance is not impossible

Purchasing defective products has always been a fear of prospective buyers. Users no longer trust the quality assurance procedures of vendors — sometimes with good reason. For example, IBM has better quality assurance programs than any other vendor — yet the early releases of its Systems Network Architecture products suffer from numerous bugs.

To avoid getting stuck with defective SNA products, users should be aware of a few tenets of SNA quality assurance:

■ IBM's SNA products sometimes deviate slightly from published SNA specifications. You cannot rely on the technique of reverse-engineering a single IBM product as a means of discovering how your emulator should work. For example, after reverse-engineering the Application System/400, you cannot be certain that your 5250 emulator will work with other types of IBM computers, such as the System/38.

■ Large firms are more likely to provide better quality assurance than small firms because they can afford to hold off shipping a product until they're sure all the bugs are out. New companies and small firms typically need to get a quicker return on their investment; often, they ship products before they've been fully tested.

■ The best minds in a company are usually devoted to research and development, not quality assurance. It is human nature to want to build the rocket, not to test it. In fact, responsibility for quality is often given to new hires as part of their training.

■ Developers cannot do their own quality assurance. Without realizing that they are actually stacking the deck, they inevitably make up test input data that is skewed toward making the program work.

In addition, when development schedules fall behind, quality assurance is the first thing to be scaled back.

■ LU 6.2 quality assurance tends to be done one application at a time. The method of LU 6.2 quality assurance used by most CPU vendors is to write a handful of CICS programs to test their Advanced Program-to-Program Communications offering. This meager testing assures only that their own transactions work, thus producing extremely buggy LU 6.2 platforms.

■ Release 1.0 of any product is usually riddled with bugs, and many people hate to touch the first release of a new product for that reason. Vendors are now wise to this though, and have taken to calling the first version Version 1.2 or Version 2.

■ Major rewrites of a product can destabilize a formerly stable product. For example, IBM's PC 3270 Version 3 passed SNA validation tests with higher scores than the product that replaced it, Personal Communications/3270.

How do you protect yourself from inadequate quality assurance testing? End users who want to use a new SNA product but fear that it may not be reliable enough for mission-critical applications may want to investigate Applied Computer Technology (ACT), a Garland, Texas, firm that specializes in determining the reliability of SNA emulators.

For $4,000 up front plus $1,000 per day to run the test and report the results, the company will run a battery of tests that will expose any flaws in the SNA emulator; these tests also measure the performance and functionality of the product. To my knowledge, ACT currently is the only firm that specializes in this business.

If the product passes ACT's tests, rest easy. If it fails and you want to use the product anyway, at least you will have a list of things that you can tell the vendor to fix. Another option is to insist that the vendor have ACT certify its 3270 emulator and other SNA products.

For APPC product assurance, IBM also offers a service through the IBM Information Network. This service requires the APPC platform vendor to dial into an IBM host and write numerous test programs to IBM's specification. There is no pass or fail; the user grades himself. Most make the decision not to fix all the bugs discovered.

Note that LU 6.2 applications themselves cannot be certified — only LU 6.2 platforms can be; it is a contradiction to certify custom-developed applications. What is tested is the underlying SNA engine, Layers 1 to 6, and the application programming interface — the boundary between Layers 6 and 7.

The best and the worst

Virtually none of the CPU vendors that implement APPC have satisfactorily performed APPC quality assurance. The best job done was for the AT&T 3B2 — probably because quality assurance of the product was originally contracted out to Orion Network Systems, Inc. However, other Orion-based implementations have not been as bug-free.

The worst job of quality assurance can probably be found in the early releases of Digital Equipment Corp.'s DECnet APPC, but even IBM managed to do a poor job of getting all the bugs out of its AS/400 and System/88 APPC. In fact, the recent independent logical unit support enhancement to the System/38 probably rates as the least tested SNA enhancement ever. But DEC and IBM shouldn't feel bad because almost every other vendor has made similar mistakes.

CPU vendors, including IBM, and those who make SNA gateways should seriously consider using ACT's testing tools to remove bugs from their products before end users find them. Vendors should test using the same LU 6.2 applications that their customers will use, instead of using a few CICS sample programs.

Vendors that do not pay the same attention to validation and quality testing as they do to research and development may find that unstable products are the fruits of their labor.

Mohen is a Systems Network Architecture specialist and consultant based in New York.

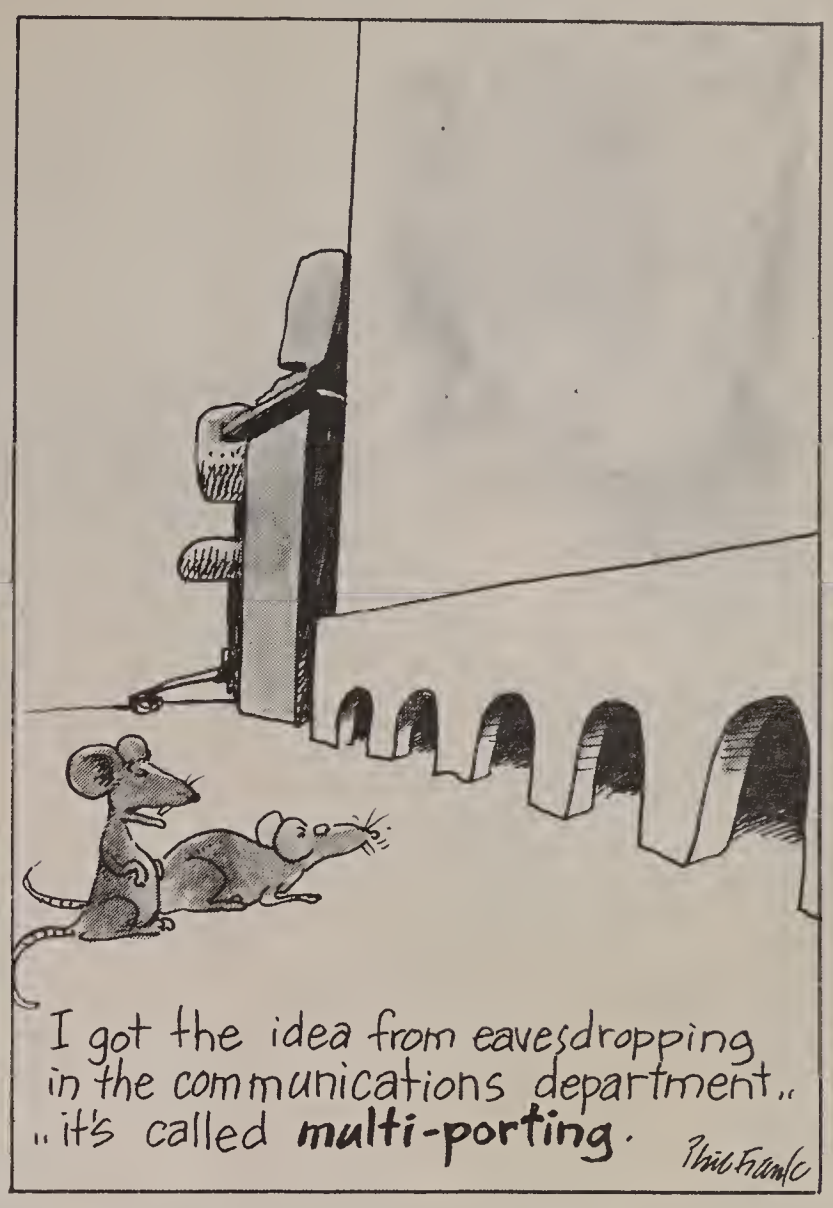
GOT A CLASSY IDEA for *Network World*'s Opinions pages? We're interested in class acts, so write down your idea and send it in!

Manuscripts should be letter-quality, double-spaced and between 600 and 900 words in length. Disk or modem submissions are preferred.

If you'd like to write a column, call Steve Moore, features editor, at (508) 820-7439, or fax your idea to us at (508) 820-3467.

TELETOONS

BY FRANK AND TROISE



LETTERS

Vendors' opinions

The editorial "Vendor information can be a dangerous gift" (*NW,* Dec. 25, 1989) states that "Vendor information is the kind of gift horse you should always look in the mouth." I agree; after all, knowledge, like beauty, is truly in the eye of the beholder.

In an effort to reach a broad cross-section of readers, *Network World* has brought to our attention the obvious — we must rely on our vendors. But we're told to beware of the marketing impetus behind a vendor's pronouncement. The risk of listening to vendors is always the same: obtaining biased information.

As a technical expert very much involved in marketing and sales, I consider it essential to be extremely well informed. I'd like to offer some additional advice to users.

Don't spurn vendor information. Welcome and accept it readily; it can be easily verified. For example, trade publications, user references and competitors' comments will contribute to the learning curve. It is not advisable for network managers to be extraordinarily wary of the tremendous resource their current or would-be vendors represent. They work in the forefront of technological innovation.

Vendors are strategic resources to be managed — not wasted.

Paul Barry
Vice-president
Technical services
Telaid Industries, Inc.
Niantic, Conn.

Blame it on Murphy

I read with interest the column "Murphy is alive and well in some companies" (*NW,* Dec. 25, 1989). I agree with most of the author's points but must disagree on a major one.

To me, Murphy's Law is not an excuse for failure, but an incentive for success. I know

(continued on page 58)

Network World *welcomes letters from its readers.*

Letters should be typed, double-spaced and sent to Editor, Network World, *161 Worcester Road, Box 9172, Framingham, Mass. 01701.*

Letters may be edited for space and clarity.

© 1990 AT&T

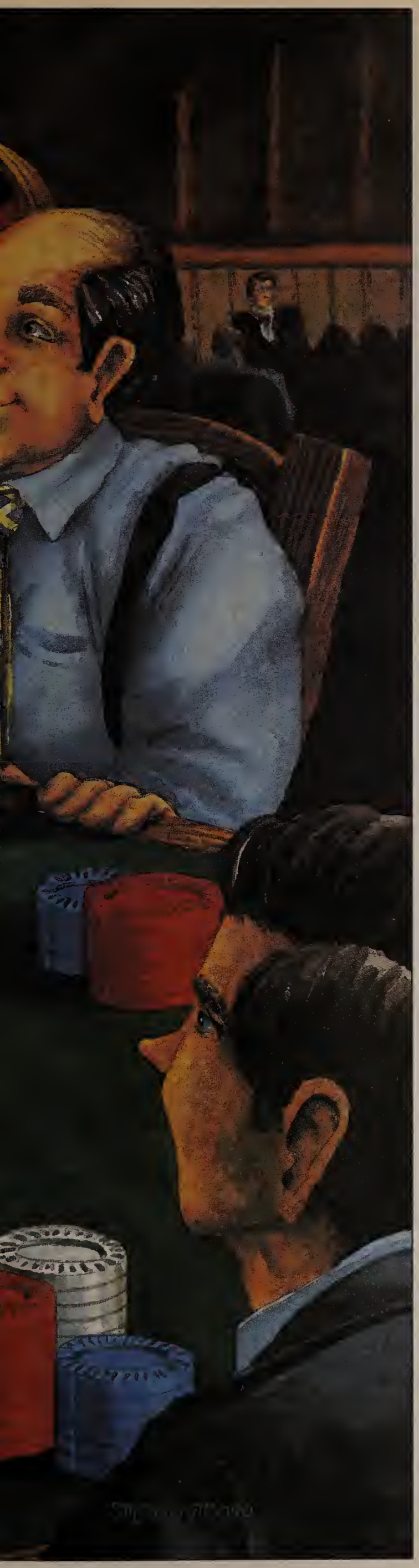
Real-World WANs.

For a school district, every dollar spent on networking means one dollar less for classrooms. And playgrounds.

A school district is just like a business: every dollar counts. That's why more and more school districts—and businesses—are discovering the real world advantages of creating a Wide Area Network (WAN) through their local phone company. Working with AT&T Network Systems, your local phone company can show you how the AT&T Datakit® Virtual Circuit Switch could network all your computers. Efficiently. Quickly. On existing twisted pair phone lines. The results for school districts? Potentially thousands of dollars in savings. And if a WAN can do that for a school district, think of what it could do for your company. Get smart. Call your local phone company marketing representative.

You and Your Local Phone Company

AT&T
Network Systems



NETWORK WORLD and INFONETICS

LAN TEST SERIES

ETHERNET ADAPTER INTEROPERABILITY

Pick a card, any card

CONTINUED FROM PAGE 1
the interoperability question can be reduced to this: Do cards from different vendors work together?

A nice surprise

Although it may be a surprise for users that in the past have bought "standards-based" products from different vendors and found them to be incompatible, the answer is yes.

Salamone is features writer for Network World.

Network World, in conjunction with Infonetics, Inc., a Santa Clara, Calif.-based consulting, market research and product testing firm, tested 10 different models of Ethernet adapter cards from six vendors. The testing shows that there are no problems in mixing adapters from different manufacturers on the same network.

Additionally, there are no problems encountered using combinations of eight- and 16-bit adapters together in either the file server or client workstations.

Interoperability issues

Because of Ethernet's popularity, the adapter card market has attracted many manufacturers, most of whom are designing and developing adapter hardware and Ethernet drivers for a variety of net operating systems.

Adapter cards are designed to meet the IEEE 802.3 Ethernet standard specifications. For most manufacturers, the proof of a suc-

(continued on page 36)

Users rejoice!
The products of major
Ethernet adapter card makers
are interchangeable.

ILLUSTRATION ©1989 TOM BARRETT

(continued from page 35)
cessful design is obtained through conformance testing.

Generally, conformance testing involves a series of low-level board tests. Such low-level tests do not directly test for interoperability. However, if a design passes the conformance tests, it is assumed by the vendor that the board has a high probability of interoperating with Ethernet adapters designed by other vendors. This presumes that all other manufacturers have built their adapters according to the IEEE 802.3 specifications and that the other vendors have performed a similar set of conformance tests.

Interoperability is also a function of the software drivers on each card. These drivers are specific to each Ethernet adapter design and integrate the adapter to a specific network operating system. The adapter driver specifications are provided by the manufacturer of the network operating system. The drivers are not tested in the IEEE 802.3 conformance testing so most network operating system companies take on the responsibility of certifying adapter drivers for each version of the network operating systems they produce.

> If a design passes the conformance tests, the board has a high probability of interoperating with Ethernet adapters from other vendors.
>
> ▲▲▲

> A thorough interoperability test was conducted from both a client and server perspective.
>
> ▲▲▲

Most manufacturers believe that proper conformance and certification testing is sufficient to catch most interoperability problems. This makes sense in theory, but in some instances, network performance degradation due to interoperability may go undetected because Ethernet protocols are masking adapter interoperability problems. That can be costly, particularly when a bottleneck is incorrectly blamed on a file server processor or a disk subsystem, and not on the adapter card.

This test was designed to determine whether Ethernet adapter interoperability problems exist and to do so in a way that would reveal the true source of any problems identified.

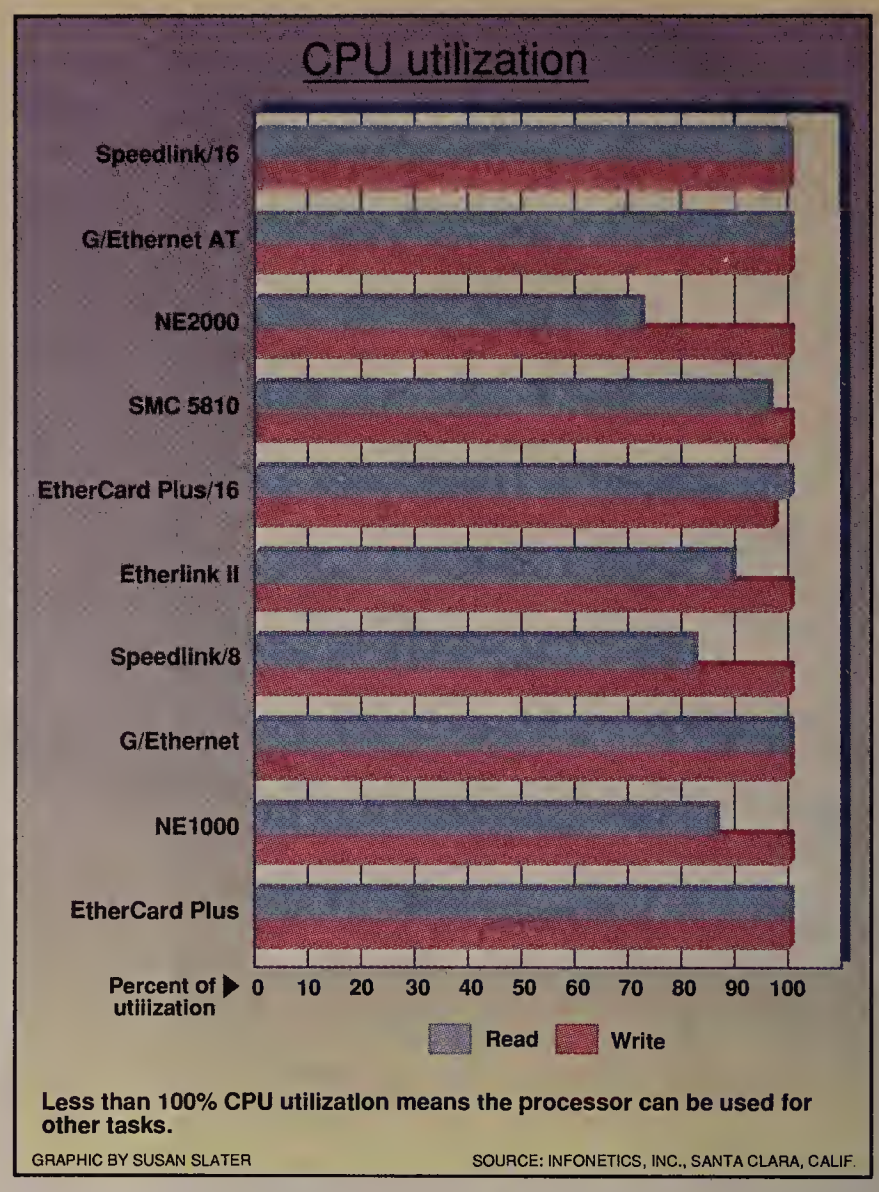
Methodology

Infonetics developed the testing methodology for this study. The test LAN configuration consisted of 10 client stations and one server. The client stations were identical 8-MHz, zero-wait-state, Intel Corp. 80286-based Personal Computer AT clones with 640K bytes of memory. The server was a 25-MHz, zero-wait-state Zenith Data Systems Zenith 386/25 with 4M bytes of memory. The network operating system was Novell, Inc.'s NetWare Version 2.15.

LAN TEST SERIES

Ten Ethernet adapter cards were used in this test for interoperability, including five eight-bit and five 16-bit adapters from six manufacturers (see "CPU utilization" chart, this page). All the market leaders were invited to participate. (For details on the selection process, see "Selection criteria," this page.)

During the interoperability testing sequence, each client station had a different network adapter installed. The interoperability test involved 10 runs. The client/adapter configurations remained the same for all 10 trials, but each run involved a change in the server's adapter. In this way, each adapter in the study was tested in the server once, while the mix of 10 different adapters in the client stations remained the same. Thus, a thorough interoperability test was conducted from both a client and server perspective.



> Perform Time generated a network load that maximized the throughput on the server's adapter.
>
> ▲▲▲

Perform Time, a testing program developed by Infonetics, was used to generate network traffic for the interoperability testing. Perform Time generated a network load that maximized the throughput on the server's adapter. Two tests were run using Perform Time: a sequential read and an overlay write.

The sequential read was done by simultaneously requesting that a 1M-byte file be read from the server's memory to each of the 10 stations using a fixed 1,024-byte record. For every 1,024-byte read request, the client adapter generated a single frame, or packet.

In response, the server adapter generated a single frame containing the 1,024-byte record. The requests were generated by each station until a total of 10 1M-byte files were read from the server's cache memory. If the station and the server adapters were interoperating perfectly, the number of read request frames and the number of reply frames generated should be the same.

The overlay write was performed by having each of the 10 stations simultaneously write a 1M-byte file to the same memory location in the server's cache using 1,024-byte records. For every 1,024-byte write request, a single frame was generated by the client adapter. In response, the server adapter generated a single frame to acknowledge that the write was performed as requested.

The write requests were generated by each station until a total of 10 1M-byte files were written into the server's cache memory. If the station and the server adapters were interoperating perfectly, the number of write request frames and the number of reply frames generated should be the same.

During the testing, a network analyzer monitored network traffic. The analyzer used during this test, a Network General Corp. Sniffer, captured paired frame counts for each client/server

> During the testing, a network analyzer monitored network traffic.
>
> ▲▲▲

(continued on page 40)

Selection criteria

Two primary criteria were applied in selecting Ethernet adapter cards for the first test in the *Network World*/Infonetics LAN Test Series.

The first factor in the selection process was the product's commercial availability: Only adapters that users can go out and buy today were tested. Prototype models or products undergoing beta-testing were not included.

The second factor was market share. Three vendors, 3Com Corp., Western Digital Corp. and Novell, Inc., together control 66% of the adapter card market, based on 1988 worldwide shipments for U.S.-based vendors.

All three participated in this test.

While it was not possible to test all the products in the market, three additional vendors' adapters were included (see accompanying table).

The market share leaders may have changed relative positions during 1989 — market share for 1989 Ethernet adapter shipments was not available at press time — however, analysts said they believe the same three companies remain on top.

— Salvatore Salamore

Ethernet adapter cards tested

Manufacturer	Model	Type
Gateway Communications, Inc.	G/Ethernet	8 bit
	G/Ethernet AT	16 bit
Everex Systems, Inc.	Speedlink/8	8 bit
	Speedlink/16	16 bit
Novell, Inc.	NE1000	8 bit
	NE2000	16 bit
Standard Microsystems Corp.	SMC 5810	16 bit
3Com Corp.	Etherlink II	8 bit
Western Digital Corp.	EtherCard Plus	8 bit
	EtherCard Plus/16	16 bit

GRAPHIC BY SUSAN SLATER
SOURCE: INFONETICS, INC., SANTA CLARA, CALIF.

WHEN THE STAKES ARE HIGH, CHOOSE SUPERIOR TECHNOLOGY

LATTISNET SYSTEM 3000

Your local area networks grow more valuable over time. More and more, they're expected to deliver a multi-faceted, highly sophisticated utility service. The more complex they get, the more you want an integrated, flexible system that satisfies your connectivity requirements.

SynOptics Communications knows what you need – superior technology that delivers the standards-based, multi-vendor utility that will satisfy your networking requirements for years to come.

As the cornerstone of SynOptics' *Network Utility Architecture* – a concept that regards networks as indispensable communications utilities – we've developed the System 3000 family, a value-added networking system that will carry you into the 1990s.

The System 3000 offers:

- advanced network management;
- a full-color graphic representation of the network;
- simultaneous support of Ethernet, Token Ring and FDDI LANs; and
- integrated local bridging.

SynOptics is delivering the value-added LAN solutions of the future – today.

With over 200,000 twisted pair nodes shipped to more than 500 customer sites worldwide, SynOptics is the leader in twisted pair Ethernet. As a standards-based company, SynOptics designs its products with a migration path to emerging and de facto standards. Now, with the System 3000, SynOptics is shaping the future of networking with product solutions today.

For more information about the System 3000, call SynOptics toll-free at (800) PRO-8023, ext. 2616.

SynOptics Communications, Inc.

SynOptics Communications, Inc., Dept. 500, 501 East Middlefield Road, Mountain View, CA 94043-4015 (415) 960-1100

© 1989 SynOptics Communications, Inc. LattisNet is a registered trademark and SynOptics is a trademark of SynOptics Communications, Inc. Other brand and product names are registered trademarks or trademarks of their respective holders.

See the FAXNeT Form on Page #51

Start helping your customers even before you answer their calls.

CAROL HODGES
148 HIGHLAND A
ACCOUNT #6165
AVAIL CREDITS
PAYMENT STATUS

Unlike AT&T, MCI 800 Service℠ offers real-time ANI* today, using the standard signaling technology you already have. So now you can access a complete customer profile on your terminal before you even answer the call. It makes your business more efficient and helps you provide better service to your customers.

You also get some of the most advanced routing features available in the industry. Like Direct Termination Overflow℠ (DTO). If your dedicated MCI 800 lines are jammed with customers, it automatically switches the extra calls onto your regular business lines. Something AT&T doesn't do for you.

And if you have multiple locations we can give you a single 800 number for all of them, no matter what kinds of lines they're currently using. Along with one bill that details each call. Unlike AT&T, we offer Call Detail to all our customers. And MCI's Call Detail provides the complete phone number of virtually every call. Imagine what you could do with that information.

What's more, MCI 800 Service is backed by MCI® specialists who will customize our 800 service to your needs and be there to answer questions 24 hours a day, 7 days a week.

If you sign up now, we'll give you a special credit† just for switching, plus a satisfaction guarantee. If you're not completely satisfied, we'll pay to re-install you to your old carrier.

To get a better 800 number, call ours, **1-800-888-0800**, or contact your MCI Account Representative.

*Effective 2/2/90, subject to FCC acceptance. †Credit equal to 25% of fourth month's bill for all one-year customers spending $2,500+/month per 800 number. © MCI Communications Corporation, 1990.

JE. NIDVILLE

SOS: ANADIAN LIN

ASSE

ONNEMENT

MCI®
Let us show you.

(continued from page 36)
combination on the network. The paired frame counts showed the number of requests made by the client and the number of responses returned by the server to that particular client.

For each test, paired frame counts were captured by the analyzer for each client/server combination on the network.

If there are no interoperability problems between a client adapter and the server adapter, the paired frame counts should be the same. If an interoperability problem does exist, counts could be relatively low compared to other paired frame counts because frames are being lost, or frame counts could be relatively high because of numerous retries being generated by the client adapters (see "Ethernet adapter performance issues," this page).

The test produced a total of 200 paired frame counts to analyze for the 10 Ethernet adapters. A less than 1% deviation was observed out of the 200 pairs. A deviation level of 1% is considered normal for this testing methodology. There also was no significant difference in the number of paired frame counts between the sequential read and the overlay write.

> The 10 adapters tested proved themselves to be interoperable in every configuration.
>
> ▲▲▲

Conclusion

The 10 Ethernet adapters tested proved themselves to be interoperable in every test configuration. There were no problems running different manufacturers' adapters on the same network or running combinations of eight- and 16-bit adapters together in either the file server or the client station configuration.

Did we expect these results? "Quite honestly, we [at Infonetics] were totally surprised by the outcome of the testing," says Robert Clark, vice-president of the product evaluation group. "We've been testing LANs for better than three years and have grown cynical in the process. Not in our wildest dreams did we expect to see perfect interoperability in a run with 10 different adapters." Without doubt, this is good news for users.

Ethernet adapter performance issues

Ethernet adapter card performance depends on the card's design.

High-performance Ethernet adapters are 16-bit designs with larger buffers for handling incoming and outgoing data transmissions.

The 16-bit adapters cost more than the slower eight-bit adapters so they are most commonly used only where network traffic congestion can be a problem, such as in file servers, bridges and gateways.

Some eight-bit boards have large buffers that improve performance. However, their performance is limited by the smaller data path — compared to that in the 16-bit cards — between the host computer and the adapter interface.

The slower throughput of the eight-bit cards is acceptable on a client station unless the client routinely transfers or receives large files across the network.

During the first test of the *Network World*/Infonetics LAN Test Series, a test of Ethernet adapter card interoperability, both eight- and 16-bit adapter cards were used in the server. To assess the maximum throughput possible for each card, the utilization percentage of the server's CPU was measured to determine whether the card was a potential bottleneck.

> Faster cards should generate high fragment counts.
>
> ▲▲▲

CPU utilization indicates whether you can send more data through the card. In other words, if the CPU is processing data as fast as possible, it cannot take any more data off the adapter card.

For example, the 16-bit card from Standard Microsystems Corp. was found to have a throughput of 869K byte/sec for sequential reads and 588K byte/sec for overlay writes. The CPU utilization for the adapter card was 96% for sequential reads and 99% for overlay writes.

With such high CPU utilization rates, there is no way to take advantage of the card's maximum throughput rate because the CPU has reached its number-crunching limit and has become a bottleneck. Even though the adapter card is capable of taking more data off the network and passing it along to the CPU at a faster rate, the CPU cannot process it at that rate.

Another indication of a card's performance is the number of fragments produced. Fragments are the result of collisions on the network, which occur when two stations transmit messages simultaneously. Collisions are normal for Ethernet networks; when a network is saturated, the number of fragments goes up very quickly.

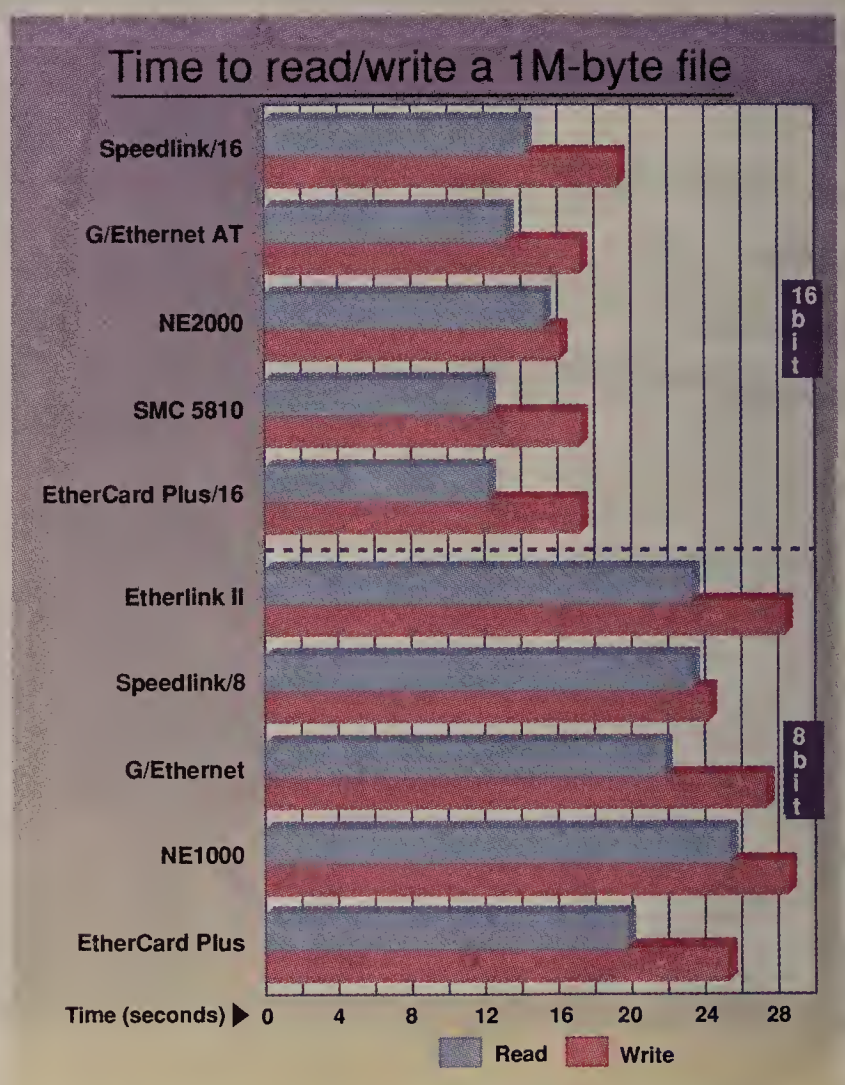
Faster cards should generate higher fragment counts. The faster card will ask if the network is clear and then immediately try to send data out over the network; it doesn't wait as long as a slower card to broadcast. To boost a card's performance, its designer could opt to shorten the time between detecting a clear network and sending a message. This would produce more collisions on the network, but it can boost the card's performance.

For example, both Everex Systems, Inc. cards had a relatively high number of fragments. These cards are working on the leading edge of technology, according to Robert Clark, vice-president of the product evaluation group at Infonetics, Inc.

A caveat

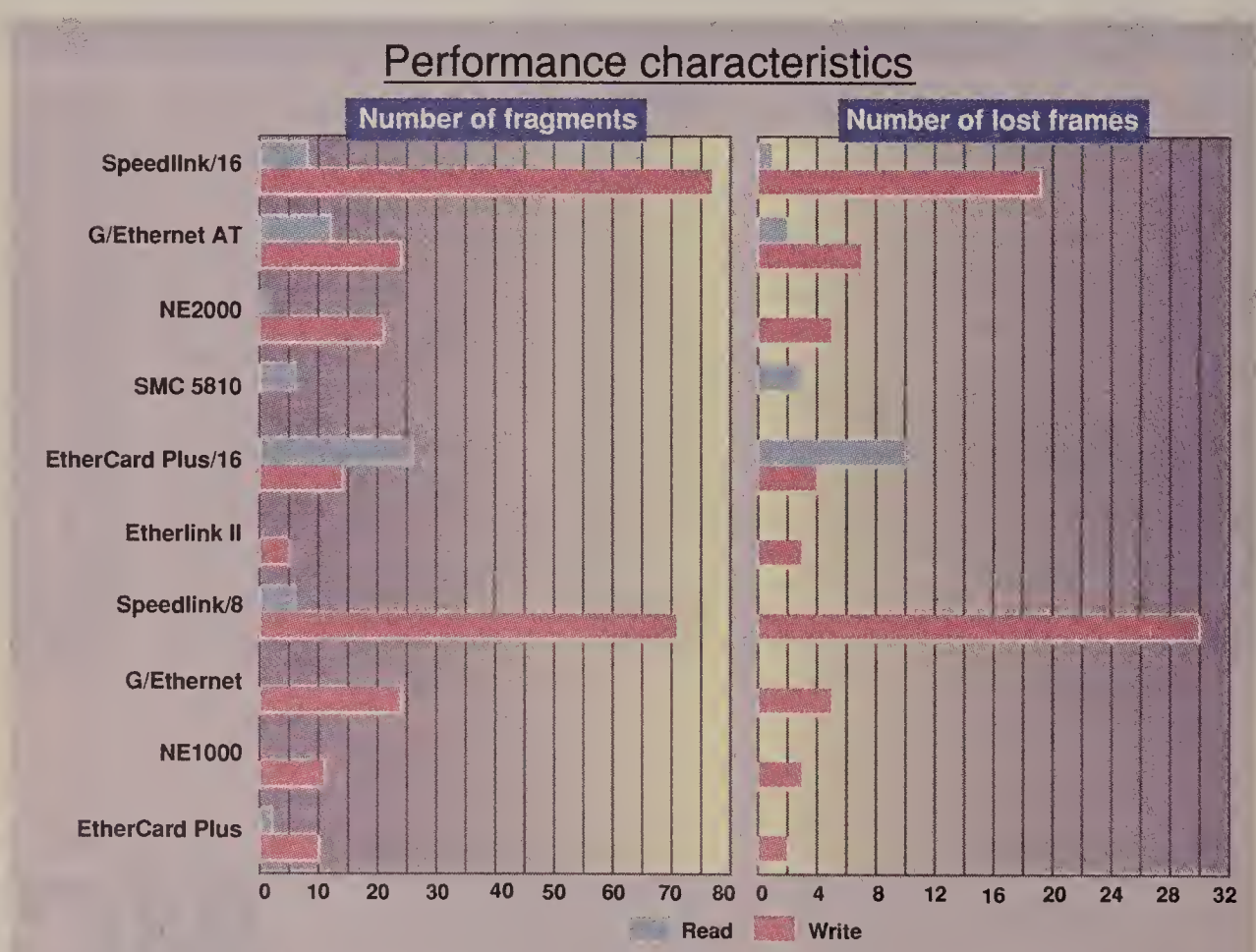
"The one thing to realize is that most networks don't work the adapter cards as hard as they are working under these particular tests," Clark explains. "We are really stressing the boards here, so [in the case of the Everex cards] 76 fragment counts out of 20,000 frames may look like it's high. Under most real network conditions, though, you probably wouldn't get up to that type of network traffic load."

— Salvatore Salamone



The larger data path on the 16-bit adapter cards allows the cards to read or write a 1M-byte file faster than the 8-bit cards.

GRAPHIC BY SUSAN SLATER SOURCE: INFONETICS, INC., SANTA CLARA, CALIF.



High fragment counts and lost frames, while sounding negative, actually indicate a card is pushing the edge of technology.

GRAPHIC BY SUSAN SLATER SOURCE: INFONETICS, INC., SANTA CLARA, CALIF.

This is your free ticket to networking in the 90's!

Communication Networks '90

Taking Networking into the 90's

February 6-8, 1990

Washington, D.C. Convention Center
990 Ninth Street, Washington, D.C.

The Ramada Renaissance/Techworld
999 Ninth Street, Washington, D.C.

Come early and see everything

Exposition Hours:
Tuesday .....Feb. 6 ...10:00 a.m. - 5:30 p.m.
Wednesday ...Feb. 7 ...10:00 a.m. - 5:30 p.m.
Thursday .....Feb. 8 ...10:00 a.m. - 4:00 p.m.

Registration Hours:
Sunday .....Feb. 4 ...3:00 p.m. - 5:30 p.m.
Monday .....Feb. 5 ...7:30 a.m. - 5:30 p.m.
Tuesday .....Feb. 6 ...6:30 a.m. - 5:30 p.m.
Wednesday ...Feb. 7 ...6:30 a.m. - 5:30 p.m.
Thursday .....Feb. 8 ...6:30 a.m. - 4:00 p.m.

THE NEXT DECADE may be the most exciting and fast moving yet in the world of communications. And there's no better place to see the future before it unfolds than the exhibit hall at Communication Networks '90, the premiere communications conference and exposition that's taking networking into the '90s.

Almost all of the leading communications suppliers will be there — more than 400 of them — with their latest products and services. See the reverse side of this ticket for a complete listing. You'll also get a chance to see ISDN in action at our multi-booth ISDN demonstration in the Ramada Renaissance/Techworld. And if you want to learn from the industry's top experts, CN '90 also offers a complete conference program.

For more information, please call toll-free (800) 225-4698.

ADMIT ONE FREE
(a $20 value—good for admission to exposition only—no one under 18 years of age admitted)

NWW

This is your free ticket to networking in the 90's!

Communication Networks '90

Taking Networking into the 90's

February 6-8, 1990

Washington, D.C. Convention Center
990 Ninth Street, Washington, D.C.

The Ramada Renaissance/Techworld
999 Ninth Street, Washington, D.C.

Come early and see everything

Exposition Hours:
Tuesday .....Feb. 6 ...10:00 a.m. - 5:30 p.m.
Wednesday ...Feb. 7 ...10:00 a.m. - 5:30 p.m.
Thursday .....Feb. 8 ...10:00 a.m. - 4:00 p.m.

Registration Hours:
Sunday .....Feb. 4 ...3:00 p.m. - 5:30 p.m.
Monday .....Feb. 5 ...7:30 a.m. - 5:30 p.m.
Tuesday .....Feb. 6 ...6:30 a.m. - 5:30 p.m.
Wednesday ...Feb. 7 ...6:30 a.m. - 5:30 p.m.
Thursday .....Feb. 8 ...6:30 a.m. - 4:00 p.m.

THE NEXT DECADE may be the most exciting and fast moving yet in the world of communications. And there's no better place to see the future before it unfolds than the exhibit hall at Communication Networks '90, the premiere communications conference and exposition that's taking networking into the '90s.

Almost all of the leading communications suppliers will be there — more than 400 of them — with their latest products and services. See the reverse side of this ticket for a complete listing. You'll also get a chance to see ISDN in action at our multi-booth ISDN demonstration in the Ramada Renaissance/Techworld. And if you want to learn from the industry's top experts, CN '90 also offers a complete conference program.

For more information, please call toll-free (800) 225-4698.

ADMIT ONE FREE
(a $20 value—good for admission to exposition only—no one under 18 years of age admitted)

NWW

You'll be in good company at CN '90

The CN '90 Exhibitor List: (as of 12/8/89) ADC Telecommunications • ADACOM • Advanced Computer Communications • Advanced Computing Environments • Advintech Corp.• Alcatel Network Systems/Transcom • Allen-Bradley Communication Div. • ALLTEL Supply • Almetek Industries • AMCO Engineering • Amdahl Corp. • American Communications • American Computer and Electronics Corp. • American Institute • American Power Conversion Corp. • American Private Line Services • Ameritec Corp. • AMNET • AMP • ANDO Corp. • Anixter • Applied Computing Devices • Applied Voice Technology • ARK Electronic Prodcucts • Artel Communications Corp. • Astrocom Corp. • Atelco US • AT&T • AT&T Paradyne • Ausimont USA • Avanti Communications Corp. • Barr Systems • BBN Communications • Belden Wire & Cable • Belkin Components • Bell Atlantic • Bellcore • BellSouth • Berk-Tek • Berry Electronics • BICC Data Networks • Black Box Corp. • Boole & Babbage/Avant Guard • Bowmar Telecommunications Div. • BT Datacom • BT Tymnet • *Business Communications Review* • *Business & Technology Consultant* • Bytex Corp. • Cabletron Systems • CACI Products • Canadian Embassy • Canoga-Perkins • CASE/Datatel • CCMI/McGraw-Hill • C-COR Electronics • Centel Federal Systems • CHI/COE Information Management • Chromatic Technologies • Chipcom Corp.• Cincinnati Bell Information Systems • Cincom Systems • *CIO Magazine* • cisco Systems • Clear Communications Corp. • Clearpoint Research Corp. • CMC • COASTCOM • Codex • Coherent Communications Systems Corp. • Combyte USA • Comm/Scope, Network Cable Div. • Communication Devices • *Communications News* • *Communications Week* • Complementary Solutions • Compression Labs • Computer Cable • *Computer Digest* • Computer Intelligence • Computer Network Technology • Computer System Products • Computerm Corp. • *Computers in Banking* • *Computerworld* • *Computerworld Focus* • COMSAT World Systems • Comsel Corp. • ComStream Corp. • Connections Telecommunications • Contel ASC • Control Cable • Control Resources • Cordell Manufacturing • Corning Glass Works • CrossComm Corp. • Crosspoint Systems • Cryptall LP • C-TEC Communications • CXR Telcom/Anderson Jacobson • Cylink Corp. • Cylix Communications Corp. • Cylix Corp. • *Data Communications* • Data General Corp. • Data Set Cable • Data Switch Corp./T-Bar • Datacom Technologies • Datapro • Oataprobe • Data-Tech Institute • David Systems • OBP TELEKOM • DCA • Develcon Electronics • DGM&S • Dictaphone Corp. • Digicom Systems • Digilog • Digital Equipment Corp. • Digital Link Corp. • Digital Microwave Corp. • Digital Pathways • Digital Technology • Digitech Industries • DMW Commercial Systems • Doelz • Dowty Information Systems • DSC Communications Corp. • Dynatech Communications • E-COMMS • EDA Instruments • EICON Technology Corp. • Electrodata • Electronic Telecommunications • Equinox • E-Tech Research • Everest Electronic Equipment • Experdata • Fairchild Data Corp. • Famous Telephone Supply • *Federal Computer Week* • Ferranti Datacom • FiberCom • Fibermux Corp. • *FiberOptic Product News* • Fibronics International • FICOMP • FOCS • Forte • Fotec • Franklin Datacom • Frederick Engineering • FTS/Austron • Fujitsu America • Gandalf Data • GE Information Services • General Datacomm • General Instrument, Jerrold Div. • Glasgal Communications • GMP • GNWC Wire, Cable & Network Products • *Government Computer News* • Granger-Telettra • Graybar Electric • GTE Corp. • GTE Spacenet • Hadax Electronics • Halley Systems • Hard Engineering • Hekimian Laboratories • Henderson Communications Corp. • Henkels & McCoy • Hewlett-Packard • HI-TECH Cable Connection • Hitachi America • Homaco • Hughes LAN • Hughes Network Systems • IBM Corp. • ICC Communications • IDACOM • IDG Communications • IEEE Communications Soc. • Integrated Network Corp. • INFO Group • Information Publishing Corp. • Informer Computer Terminals • Infotron Systems Corp. • IN-NET Corp. • Integrated Telecom Corp. • International Data Corp. • International Data Sciences • International Microwave Corp. • InternetiX • Intratec Systems • Inventory Locator Service • ISICAD • ITT Communications Services • Jupiter Technology • KAMPUTECH • Kentrox Industries • KMW Systems • Kramer Systems International • Krone • *LAN Technology* • LANEX Corp. • Lanier Voice Products • Lannet Data Communications • Larse Corp. • Laser Precision Corp. • LeeMah DataCom Security Corp. • LEGENT Corp. • Leviton Telcom • LICOM • Light Control Systems • Lightwave Systems • Logica Data Architects • Luxcom • M/A-COM MAC • Management Systems Designers • McOATA Corp. • MCI Telecommunications Corp. • Memotec Data • Micom Communications Corp. • Microlog Corp. • Microtest • Microtronix Datacom • Microwave Networks • MilesTek • *MIS Week* • Mitek Systems Corp. • Mitsubishi Electronics America • MOD-TAP System • Mohawk Wire and Cable Corp. • Montrose Products • Motorola C & E • Multi-Tech Systems • National Satellite Paging • NCR Comten • NEC America • NEK Cable • Netcom Technologies • NetExpress Communications • NetQuest Corp. • NETRIX Corp. • Network Communications Corp. • Network Design & Analysis Corp. • Network Equipment Technologies • Network General Corp. • Network Products • Network Research Corp. • Network Systems Corp. • *Network World* • *Networking Management* • Nevada Western • Newbridge Networks • NMI/Network Analysis Center • Norland Products • North Hills Electronics • North Supply • Northern Telecom • NOVA USA • NTT America • Nu Data • NYNEX • Octocom Systems • OFTI • Okidata • Omnicom • Opcom • Optelecom • Optical Cable Corp. • Optical Data Systems • OSIware • OST • PA Consulting Group • Pacific Bell • Panduit Corp. • Patton Electronics Co. • *PC Week* • Penril Datacomm • Phoenix Microsystems • PictureTel Corp. • Pilot Research Associates • Pirelli Cable Corp. • Plantronics Futurecomms • Processing Telecom Technologies • Progressive Computing • Promptus Communications • Proteon • PTT Telecom • Pulsecom Div./Hubbell • Quintrel Corp. • Racal InterLan • Racal-Milgo • Rad Data Communications • Radiant Communications • Random Corp. • Raycom Systems • Reliance Comm/Tec • Remee Products Corp. • Renex Corp. • Rent-A-Computer • Retix • RND-Rad DataNetwork Devices • Rockwell International • Rose Electronics • Sargent Fiber Optic Services • SATNET • SBE • Scientific-Atlanta • Scitec Communication Systems • Seiscor Technologies • Sel-Tronics • Semitron Cricklade • *Service News* • Shure Teleconferencing Systems • Siecor Corp. • Sierra/LSI Jennings • Soft-Com • Solunet • South Hills Electronics • Southwestern Bell Telephone • Space Communication Systems • Spider Systems • SRA Telecom • SSE Technologies • STAR-TEK • Stonehouse & Co. • Stratacom • Superior Optics • Superior TeleTec • Suttle Apparatus, CSI Technologies • SwitchView Orbi-tel • Sync Research • Synernetics • SynOptics Communications • Systems Center • Tau-Tron • Technology Transfer Institute • Tekelec • Tektronix • Telco Research Corp. • Telco Systems NAC Corp. • Telcor Systems Corp. • Telebit Corp. • Telebyte Technology • Telecom Analysis Systems • Telecom Publishing Group • Telecom*USA • *Telecommunications* • Telecommunications Techniques Corp. • Tele-Computer Systems • *Teleconnect & Inbound/Outbound* • Telect • Teledyne Kinetics • Telefile • Telematics International • Tele-Measurements • TeleMonitor Corp. • Telenex Corp./AR Div. • Teleos Communications • *Telephone Engineer & Management* • *Telephony* • Tellabs • Teltrend • TelWatch • 3M Co.-Datacom Products Project • Tigon, The Voice Messaging Network • TIL Systems • Timeplex • Touch Communications • Touchbase Systems • Transpoint Communications • Tricomm Services Corp. • Trompeter Electronics • TRW Information Networks • TSB International • Ultra Network Technologies • Unidata Corp. • Universal Oata Systems • Universal Fiber Optics • U.S. Robotics • U.S. Sprint Limited Partnership • U.S. WEST • Valucom • VANCE Systems • Verilink Corp. • Versa-Lite Systems • Versitron • Vertex Computer Cable & Products • VIR • Vitalink Communications Corp. • Walker Facsimile Systems • Wandel & Goltermann • Washington International Teleport • *Washington Technology* • Wellfleet Communications • Westinghouse Communications Software • Wilcom Products • Williams Telecommunications Group • Wiltronix • Wiremold • Wyle Laboratories-Electronic Enclosures • XTENO Communications Corp. • Xylogics • Xyplex • Zenith Electronics Corp.

You'll be in good company at CN '90

The CN '90 Exhibitor List: (as of 12/8/89) ADC Telecommunications • ADACOM • Advanced Computer Communications • Advanced Computing Environments • Advintech Corp.• Alcatel Network Systems/Transcom • Allen-Bradley Communication Div. • ALLTEL Supply • Almetek Industries • AMCO Engineering • Amdahl Corp. • American Communications • American Computer and Electronics Corp. • American Institute • American Power Conversion Corp. • American Private Line Services • Ameritec Corp. • AMNET • AMP • ANDO Corp. • Anixter • Applied Computing Devices • Applied Voice Technology • ARK Electronic Prodcucts • Artel Communications Corp. • Astrocom Corp. • Atelco US • AT&T • AT&T Paradyne • Ausimont USA • Avanti Communications Corp. • Barr Systems • BBN Communications • Belden Wire & Cable • Belkin Components • Bell Atlantic • Bellcore • BellSouth • Berk-Tek • Berry Electronics • BICC Data Networks • Black Box Corp. • Boole & Babbage/Avant Guard • Bowmar Telecommunications Div. • BT Datacom • BT Tymnet • *Business Communications Review* • *Business & Technology Consultant* • Bytex Corp. • Cabletron Systems • CACI Products • Canadian Embassy • Canoga-Perkins • CASE/Datatel • CCMI/McGraw-Hill • C-COR Electronics • Centel Federal Systems • CHI/COE Information Management • Chromatic Technologies • Chipcom Corp.• Cincinnati Bell Information Systems • Cincom Systems • *CIO Magazine* • cisco Systems • Clear Communications Corp. • Clearpoint Research Corp. • CMC • COASTCOM • Codex • Coherent Communications Systems Corp. • Combyte USA • Comm/Scope, Network Cable Div. • Communication Devices • *Communications News* • *Communications Week* • Complementary Solutions • Compression Labs • Computer Cable • *Computer Digest* • Computer Intelligence • Computer Network Technology • Computer System Products • Computerm Corp. • *Computers in Banking* • *Computerworld* • *Computerworld Focus* • COMSAT World Systems • Comsel Corp. • ComStream Corp. • Connections Telecommunications • Contel ASC • Control Cable • Control Resources • Cordell Manufacturing • Corning Glass Works • CrossComm Corp. • Crosspoint Systems • Cryptall LP • C-TEC Communications • CXR Telcom/Anderson Jacobson • Cylink Corp. • Cylix Communications Corp. • Cylix Corp. • *Data Communications* • Oata General Corp. • Data Set Cable • Data Switch Corp./T-Bar • Datacom Technologies • Datapro • Dataprobe • Data-Tech Institute • David Systems • DBP TELEKOM • DCA • Develcon Electronics • DGM&S • Dictaphone Corp. • Digicom Systems • Digilog • Digital Equipment Corp. • Digital Link Corp. • Oigital Microwave Corp. • Digital Pathways • Digital Technology • Digitech Industries • DMW Commercial Systems • Doelz • Dowty Information Systems • DSC Communications Corp. • Dynatech Communications • E-COMMS • EDA Instruments • EICON Technology Corp. • Electrodata • Electronic Telecommunications • Equinox • E-Tech Research • Everest Electronic Equipment • Experdata • Fairchild Data Corp. • Famous Telephone Supply • *Federal Computer Week* • Ferranti Datacom • FiberCom • Fibermux Corp. • *FiberOptic Product News* • Fibronics International • FICOMP • FOCS • Forte • Fotec • Franklin Datacom • Frederick Engineering • FTS/Austron • Fujitsu America • Gandalf Data • GE Information Services • General Datacomm • General Instrument, Jerrold Div. • Glasgal Communications • GMP • GNWC Wire, Cable & Network Products • *Government Computer News* • Granger-Telettra • Graybar Electric • GTE Corp. • GTE Spacenet • Hadax Electronics • Halley Systems • Hard Engineering • Hekimian Laboratories • Henderson Communications Corp. • Henkels & McCoy • Hewlett-Packard • HI-TECH Cable Connection • Hitachi America • Homaco • Hughes LAN • Hughes Network Systems • IBM Corp. • ICC Communications • IDACOM • IDG Communications • IEEE Communications Soc. • Integrated Network Corp. • INFD Group • Information Publishing Corp. • Informer Computer Terminals • Infotron Systems Corp. • IN-NET Corp. • Integrated Telecom Corp. • International Data Corp. • International Data Sciences • International Microwave Corp. • InternetiX • Intratec Systems • Inventory Locator Service • ISICAD • ITT Communications Services • Jupiter Technology • KAMPUTECH • Kentrox Industries • KMW Systems • Kramer Systems International • Krone • *LAN Technology* • LANEX Corp. • Lanier Voice Products • Lannet Data Communications • Larse Corp. • Laser Precision Corp. • LeeMah OataCom Security Corp. • LEGENT Corp. • Leviton Telcom • LICOM • Light Control Systems • Lightwave Systems • Logica Data Architects • Luxcom • M/A-COM MAC • Management Systems Designers • McDATA Corp. • MCI Telecommunications Corp. • Memotec Data • Micom Communications Corp. • Microlog Corp. • Microtest • Microtronix Datacom • Microwave Networks • MilesTek • *MIS Week* • Mitek Systems Corp. • Mitsubishi Electronics America • MOD-TAP System • Mohawk Wire and Cable Corp. • Montrose Products • Motorola C & E • Multi-Tech Systems • National Satellite Paging • NCR Comten • NEC America • NEK Cable • Netcom Technologies • NetExpress Communications • NetQuest Corp. • NETRIX Corp. • Network Communications Corp. • Network Design & Analysis Corp. • Network Equipment Technologies • Network General Corp. • Network Products • Network Research Corp. • Network Systems Corp. • *Network World* • *Networking Management* • Nevada Western • Newbridge Networks • NMI/Network Analysis Center • Norland Products • North Hills Electronics • North Supply • Northern Telecom • NOVA USA • NTT America • Nu Data • NYNEX • Octocom Systems • OFTI • Okidata • Omnicom • Opcom • Optelecom • Dptical Cable Corp. • Optical Data Systems • OSIware • OST • PA Consulting Group • Pacific Bell • Panduit Corp. • Patton Electronics Co. • *PC Week* • Penril Datacomm • Phoenix Microsystems • PictureTel Corp. • Pilot Research Associates • Pirelli Cable Corp. • Plantronics Futurecomms • Processing Telecom Technologies • Progressive Computing • Promptus Communications • Proteon • PTT Telecom • Pulsecom Div./Hubbell • Quintrel Corp. • Racal InterLan • Racal-Milgo • Rad Data Communications • Radiant Communications • Random Corp. • Raycom Systems • Reliance Comm/Tec • Remee Products Corp. • Renex Corp. • Rent-A-Computer • Retix • RND-Rad DataNetwork Devices • Rockwell International • Rose Electronics • Sargent Fiber Optic Services • SATNET • SBE • Scientific-Atlanta • Scitec Communication Systems • Seiscor Technologies • Sel-Tronics • Semitron Cricklade • *Service News* • Shure Teleconferencing Systems • Siecor Corp. • Sierra/LSI Jennings • Soft-Com • Solunet • South Hills Electronics • Southwestern Bell Telephone • Space Communication Systems • Spider Systems • SRA Telecom • SSE Technologies • STAR-TEK • Stonehouse & Co. • Stratacom • Superior Optics • Superior TeleTec • Suttle Apparatus, CSI Technologies • SwitchView Orbi-tel • Sync Research • Synernetics • SynOptics Communications • Systems Center • Tau-Tron • Technology Transfer Institute • Tekelec • Tektronix • Telco Research Corp. • Telco Systems NAC Corp. • Telcor Systems Corp. • Telebit Corp. • Telebyte Technology • Telecom Analysis Systems • Telecom Publishing Group • Telecom*USA • *Telecommunications* • Telecommunications Techniques Corp. • Tele-Computer Systems • *Teleconnect & Inbound/Outbound* • Telect • Teledyne Kinetics • Telefile • Telematics International • Tele-Measurements • TeleMonitor Corp. • Telenex Corp./AR Div. • Teleos Communications • *Telephone Engineer & Management* • *Telephony* • Tellabs • Teltrend • TelWatch • 3M Co.-Datacom Products Project • Tigon, The Voice Messaging Network • TIL Systems • Timeplex • Touch Communications • Touchbase Systems • Transpoint Communications • Tricomm Services Corp. • Trompeter Electronics • TRW Information Networks • TSB International • Ultra Network Technologies • Unidata Corp. • Universal Oata Systems • Universal Fiber Dptics • U.S. Robotics • U.S. Sprint Limited Partnership • U.S. WEST • Valucom • VANCE Systems • Verilink Corp. • Versa-Lite Systems • Versitron • Vertex Computer Cable & Products • VIR • Vitalink Communications Corp. • Walker Facsimile Systems • Wandel & Goltermann • Washington International Teleport • *Washington Technology* • Wellfleet Communications • Westinghouse Communications Software • Wilcom Products • Williams Telecommunications Group • Wiltronix • Wiremold • Wyle Laboratories-Electronic Enclosures • XTENO Communications Corp. • Xylogics • Xyplex • Zenith Electronics Corp.

Meganets

For managers of heavily trafficked networks, broadband communications spells relief.

Managers of overburdened nets will soon be able to cross the threshold to broadband communications, whether by accessing public networks through a broadband service or by designing their own private broadband networks.

Because they will face a wide array of options and will have to make a significant investment in new technologies, these managers will need a working knowledge of the latest developments in broadband communications to manage this transition successfully.

When applied to networking, broadband commonly refers to packet-switched voice, data and video on fiber-optic cable at speeds greater than the 45M bit/sec speed of T-3.

The first broadband networks will offer speeds of 50M to 155M bit/sec using new technologies such as asynchronous transfer mode switching, broadband metropolitan-area networks, the Fiber Distributed Data Interface (FDDI), the Synchronous Optical Network (SONET) standard, broadband Integrated Services Digital Networks and cell relay fast packet switching. These switching technologies, data formats and access protocols are just now emerging from standards committee and vendor development efforts.

Development of broadband metropolitan-area and wide-area networks (WAN) is being driven by network users' demands for capabilities not available from local-area networks, T-1 transmission services and ISDN. These include provision of enough bandwidth for transmission of graphics and images, high-speed file transfers and interconnection of high-speed premises networks — some of which operate at speeds up to 100M bit/sec, such as FDDI. Also included are distributed processing applications, such as real-time access to files, desktop publishing and shared high-resolution graphics in computer-aided design.

Now that they have upgraded their T-1 lines to T-3 pipes where feasible, managers of high-traffic networks are eyeing the potential of higher capacity broadband networks.

"The predominant high-speed linkage continues to be T-1," says Ken Shulman, director of technology and services for Teleport Communications Group, a New York-based subsidiary of Merrill Lynch & Co., Inc. that offers private-line T-1 and T-3 networking on one of the largest metropolitan networks in the country.

"But as an interconnection mechanism, T-1 is going to be exhausted," Shulman adds. "It's just not fast enough when you're talking about the growing popularity of applications on Ethernets and high-end workstations that can dump 3M bit/sec onto a network, 16M bit/sec token-ring networks and — adding insult to injury — 100M bit/sec FDDI networks. Once you get to numbers like that, T-1 seems awfully puny as an interconnection medium."

Even as recently as six to eight months ago, Shulman says his customers believed T-1 switching would be adequate until "some time in the distant, hazy future." But "within the past couple of months, at least two of our major customers discovered that the introduction of high-end workstations and these more advanced applications for sharing large volumes of data have started to overdrive their Ethernets and, in particular, to overdrive the T-1 interconnection between Ethernets. So I've been looking for faster technologies."

Sophisticated switching

Broadband networks will require more sophisticated switches than the asynchronous M13 multiplexers that have been

(continued on page 43)

Herbst is a free-lance writer based in the Washington, D.C. area.

By KRIS HERBST

ILLUSTRATION ©1990 CHRIS DEMAREST

TCP/IP for NetWare:

STOP THROWING AWAY BOARDS AND MONEY TO GET IT.

Only Racal InterLan lets any Novell user access any TCP host.

And provides ORACLE SQL*NET support.

At one-fourth the cost.

Now you can NetWare to anywhere, via the unique TCP Gateway.

Only from Racal InterLan. Thousands of Gateways are enabling over 100,000 NetWare users to access SUN workstations, UNIX machines, VAXs, IBM mainframes, and more.

And Racal InterLan's unique, user-proven TCP Gateway lets them do it without replacing network adapters. At one-fourth the cost of other, narrowly limited solutions.

Only the TCP Gateway provides connectivity from any Novell NetWare subnet: Token Ring. Ethernet. ARCnet. ProNET. You name it. Just plug the TCP Gateway card and software into your Novell server, and any TCP/IP host is within easy reach. So is support for ORACLE's SQL*NET.

Compare Versatility, Cost-Effectiveness.

	TCP Gateway	Brand "Ex"
Cost per node	$250	$1000+
Adapter choices	Any Novell network.	Ethernet only.

There's still more to the Gateway's versatility. You get TELNET terminal emulation. Reliable FTP file transfer. SMTP E-mail. Even a Sockets Library.

If you can't afford to throw away boards—and money—you can't afford to be without Racal InterLan's TCP Gateway.

Call 1-800-LAN TALK for complete details, and the name of your nearest Racal InterLan sales location.

Racal InterLan *One Source Interoperability*

155 Swanson Road, Boxborough
Massachusetts, 508 263-9929.
GSA pricing available. RACAL

Now With ORACLE SQL*NET Support!

All trademarks referenced are the property of their respective owners © 1989.

(continued from page 41)
switching T-3 circuits for the past 10 years. Although M13s are relatively inexpensive and are found throughout public networks, they are hard-wired, dumb devices that are better suited for point-to-point connections, which do not require much flexibility or monitoring, than for the more complex corporate networks.

As networking enters a period of transition to broadband communications, M13s are being replaced by intelligent digital cross-connect systems (DCS) and add/drop multiplexers (ADMs). DCS and T-3 ADMs allow more flexible circuit switching and network performance monitoring, which are useful features for networks that interconnect many 64K bit/sec, T-1 and T-3 channels.

So far, public carriers have been the primary users of T-3 multiplexers and DCS 3/1s, which are switches that interconnect DS3 and DS1 signals or DCS 3/1/0s that interconnect DS3, DS1 and DS0 signals. But private networks are now beginning to incorporate T-3 ADMs, as well as DCS 3/1s and 3/1/0s. Their use of these switches is expected to grow at a rapid pace.

ADMs do not handle as many interconnections as DCSs. However, when used along a T-3 route, they provide more flexible and efficient channel switching than either M13s or DCSs because they demultiplex DS1 signals into their component DS0 signals before remultiplexing them into DS3 signals.

This allows T-3 ADMs to add or drop an unlimited number of DS0 and DS1 channels at each network node.

SONET

The next generation of switches will be ADMs that use the SONET physical-layer standard to transmit optical, rather than electrical, signals at speeds above DS3.

SONET evolved during the AT&T divestiture, when interexchange and local exchange carriers sought a standard transmission medium to interface their interoffice trunks on fiber-optic cables. More than 40 companies joined the effort to devise a high-speed fiber-optic bit rate and protocol standard — something that telecommunications vendors had failed to develop.

Bell Communications Research first proposed SONET in 1985. Three years later, SONET Phase 1 was published in the U.S. as an ANSI standard specifying a basic synchronous transport signal of 51.84M bit/sec.

SONET-compatible interfaces that operate at this basic rate are called STS-1/OC-1 interfaces. (STS refers to the interface for electrical signals, while OC, which stands for optical carrier, is the light or photonic equivalent.)

SONET Phase 1 permits higher rates, in multiples of the 51.84M bit/sec basic rate, up to OC-48 (2.4G bit/sec) by using byte-interleaved multiplexing. Although standards have not yet been drafted for speeds above OC-48, the SONET algorithm will permit speeds up to OC-256 (13.22G bit/sec).

Designation of a 51.84M bit/sec basic rate for SONET was a significant step toward making U.S. networks compatible — if only at the physical level — with the rest of the world.

"SONET was optimized at about DS3," says Rodney Boehm, co-chairman of ANSI's SONET T1X1.5 committee and director of technology planning for Fujitsu America, Inc. in Richardson, Texas. "This doesn't work very well for Europe, where the CCITT has standardized on a 140M bit/sec rate, but SONET has the capability to link three channels together to make a 155M bit/sec channel. When you do this, [the three channels] look like a concatenated [OC-3] SONET signal, and the CCITT and SONET standard become very similar."

SONET rates are the product of a compromise that involved the U.S., Europe and Japan, according to Boehm. "For the first time, we have a common interface between the U.S. and Europe," he says. "It's really a worldwide network."

SONET allows multivendor equipment that transmits DS1 and DS3 signals to interface with optical multiplexers that operate at SONET speeds. SONET is compatible with DCSs and T-3 ADMs that use a synchronous transmission format known as SYNTRAN.

SYNTRAN-based DCSs and T-3 ADMs can convert electronic signals to SONET-compatible optical signals when used with translators. Because SONET is not fully backward-compatible with asynchronous T-3 equipment such as M13s, SYNTRAN DCSs and T-3 ADMs will be required to link existing networks with new SONET channels as they come on-line. In this way, SYNTRAN will bridge the transition to SONET networks.

SONET multiplexers combine multiplexer and protocol converter functions, allowing direct transmission of optical signals. They are just now becoming commercially available and will be used on point-to-point systems before they begin replacing DCSs and T-3 ADMs on more complex networks, according to Ray Ritchie, division manager of network transport requirements for BELLCORE in Red Bank, N.J.

Manufacturers have announced plans for SONET ADMs that support Ethernet and token-ring LAN gateways, ISDN primary access, gateways to metropolitan-area nets using the Distributed Queued Dual Bus (DQDB) and Switched Multimegabit Data Service (SMDS) standards, gateways to broadband ISDN WANs, as well as National Television Standard Code/Phase-Alternating Line and high-definition television transmissions.

The SONET standard attempts "to provide a consistent way to carry these different services, some with radically different characteristics, through public and private networks," Boehm says.

Broadband ISDN

SONET Phase 2 will include specifications for linking different vendors' circuit control and signaling channels. This will help pave the way for broadband ISDN networking. The ANSI broadband ISDN T1S1.1 and SONET T1X1.5 standards bodies have been coordinating their efforts to ensure compatibility between the two signals, and development of SONET should hasten the deployment of broadband ISDN.

The first phase of the broadband ISDN standard is scheduled for completion early this year, according to Gail Smith, chairwoman of the T1S1.1 ISDN services and architecture committee and principal product manager for Codex Corp. of Canton, Mass.

In the U.S., broadband ISDN is the most likely technology to use SONET as its physical-layer standard and will probably use SONET's 155.52M bit/sec OC-3 rate as its basic rate, Smith says.

For that reason and because the cost of STS-3/OC-3 is about equal to STS-1/OC-1 interfaces, early SONET and broadband ISDN networks will probably operate at the STS-3/OC-3 rate. The first SONET/broadband ISDN switching systems are likely to be large adjunct networks to existing ISDN switches.

The public network is beginning to use SONET, and its reliance on SONET will grow over the next several years, according to Ritchie.

"In about three years, SONET is going to be the technology of choice for new fiber installation in the public network," he says. "This means that at some point during this time, it may be possible for private network users to start requesting SONET interfaces from the public network. In about that same time frame, manufacturers of smart multiplexers based on T-1 will be working on smart SONET-based multiplexers aimed at the private network world."

Putting the future on hold

Because they are skeptical about the adequacy of ISDN, some network managers say they may delay any major commitment to new technologies until the advent of broadband ISDN, which is now projected for the mid-1990s.

"The Bell operating companies continue to say that ISDN is a good substitute for LANs and that it will provide interconnection capabilities for LANs," says Teleport's Shulman. "My view is that if T-1 is becoming too small to interconnect Ethernet LANs, how is it possible that ISDN will be sufficient when its primary rate is just T-1? I think you are going to find any claims that LANs and LAN interconnections are a viable ISDN application will begin to fade."

SONET, broadband ISDN and other broadband networking technologies will rely on asynchronous transfer mode, a switching and multiplexing technique that multiplexes relatively small, fixed-sized digital information packets called cells, rather than the time-division multiplexer (TDM) method that is used in current networks, including ISDNs. The uniform size of cells helps make the asynchronous transfer mode a much more efficient switching technique than TDM.

"An [asynchronous transfer mode]-based network allows easier integration — multiplexing and switching — of very different types of traffic," says George Dobrowski, subchairman of the T1S1.1 network services aspects committee and district manager of advanced network technology for BELLCORE in Holmdel, N.J. "You can mix data and voice, or continuous bit rate services with very variable burst-rate data-type services, without having separate, segregated networks."

Asynchronous transfer mode also supports a more flexible division of bandwidth resources.

"Unlike ISDN, which uses fixed rate channels, [asynchronous transfer mode] provides a wide range of channel rates," Dobrowski says. "You don't have the problem of deciding what size pipe you will need. Basically, you can negotiate with the network for any size bandwidth."

Currently, some vendors are offering a

(continued on page 52)

Multi-Media
Multi-Protocol
Multi-LAN

MultiNet

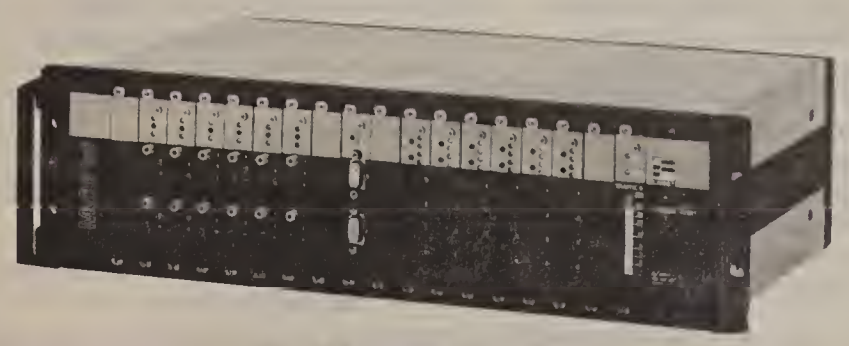
Modular Networking from

LANNET

The age of modular, manageable **MultiNet**working Infrastructure is here - and LAN/WAN connectivity will never be the same.
A single compact **MultiNet** hub can interconnect sync Ethernet fiber backbones, 10 BASE-T twisted pair links, thin and thick Ethernet coax segments and transceiver AUI links. Integrated bridges can provide the required functions of internetwork filtering and WAN management.
Token Ring modules allow the two most popular LAN types to coexist in the same **MultiNet** hub and under the supervision of the same Net(work) Man(agement).
Many additional features are aimed at long term reliability and "future-proofness": real-time redundancy on port and transceiver links, accommodation of upcoming interface standards such as 10 BASE-T and 10 BASE-F, VLSI core with high MTBF's, auto-power backup and high optical power budgets - to name a few.
Let us help you **MultiNet**work.

LANNET

U.S. Headquarters:
151 West Passaic St
Rochelle Park N J 07662
Phone (201) 587-8822
Fax (201) 587-8847
Telex 6502403647 MCI

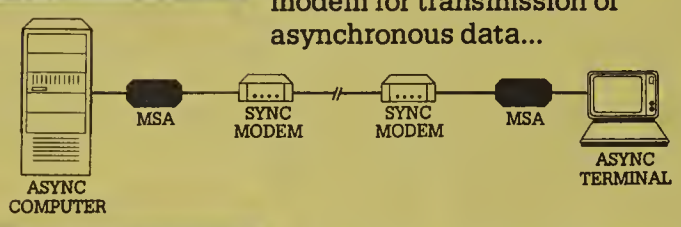


See us at ComNet Booth #2034.

DATA COMMUNICATIONS

RAD TO THE RESCUE.

THE PROBLEM: You want to use a synchronous modem for transmission of asynchronous data...



THE SOLUTION: RAD's miniature aysnc to sync converter, MSA-1, enables connection of async equipment to sync channels.

The MSA-1 performs the async to sync conversion in compliance with V.22 bits standard, accommodating differences in frequency between the async port and sync modem. It automatically adjusts to data rates up to 19.2 kbps and accommodates all async character formats. Delivered complete with cable and connectors, the MSA-1 is easy to install and operates without AC power.

From the growing Rad family.

RAD data communications ltd.

U.S. Headquarters
151 West Passaic St., Rochelle Park, NJ 07662, Tel: (201) 587-8822, Telex: 6502403647 MCI, Fax:(201) 587-8847

Circle Reader Service No. 11

NETVIEW-NET/MASTER NETWORK MANAGEMENT

NetView Goes To NEW Places

With NetQuest's new products, NetView is going where it has never been before. NetQuest introduces a new way of using standard NetView (or Net/Master) in management of non-SNA networks. This new method expands NetView modem and DSU/CSU management into network configurations not manageable until now.

NetQuest Expands NetView Management Into:

- **SNA/LPDA lines with non-IBM modems or DSU/CSU's.**
- **Unisys, DEC, CDC or other non-SNA host's sync and async lines.**
- **Remote IBM AS400, System 38, Series 1 and similar lines.**
- **SNA over X.25 lines (SNA, NPSI and QLLC).**

LPDA CONTROLLER for integration of non-IBM modems and DSU/CSU's into NetView.

V.32 MODEM industry's first V.32 NetView modem with NetView diagnostics, VTAM and NetView dialing.

DSU/CSU for DDS lines with NetView primary channel diagnostics, speeds to 56 Kbps.

LDM point-to-point, multipoint and tail circuit private line modem, speeds to 72 Kbps.

NetQuest transmission products link directly to NetView (NCP) and are not NetView PC based. They perform LPDA diagnostics and functions necessary to allow non-SNA networks to transmit NetView LPDA diagnostic messages. SNA or non-SNA lines may be controlled anywhere in the network regardless of the location of the NetView host.

Visit us at COMNET '90 Booth #1564

NetQuest Corporation

129H Gaither Drive, Mt. Laurel, NJ 08054
(609) 866-0505 • FAX (609) 866-2852

NetView® is a registered trademark of IBM Corporation.
Net/Master® is a registered trademark of Cincom Systems, Inc.

Circle Reader Service No. 9

ANALYZE DATA LINE PERFORMANCE

Analyze Data Line Performance

- **Reveal utilization trends.**
- **Measure response time.**
- **Plan network evolution.**
- **Troubleshoot contention problems.**
- **Evaluate transaction impact.**
- **Analyze network changes.**
- **Choose SNA, Bisync, X.25, or Burroughs poll/select.**

The PC-based PA1 Performance Analyzer lets you analyze over 35 network parameters using easy-to-read color graphics and printed reports. Response time, exception and over-threshold reports help you quickly find problem areas. Line utilization data reveals overloaded equipment and underused capacity.

Know what's happening on your data lines. Call us for our PA1 demo or a 15-day free product trial.

Progressive Computing, Inc.
814 Commerce Drive, Suite 101
Oak Brook, IL 60521-1919 USA
(708) 574-3399 FAX (708) 574-3703

Circle Reader Service No. 1

DATACOMM MATRIX SWITCH

NEW DIMENSIONS
Distributed Tandem Matrix Switch

LARGEST CAPACITY **Smallest Size** **lowest cost**

MTRX-500	512 Ports up to 64 Kbps	7½"
MTRX-4000	4096 Ports up to 64 Kbps	15"
MTRX-8000	8192 Ports up to 64 Kbps	28"

Salient Benefits:

- Fractional T-1, from 64 Kbps to 2.048 Mbps
- 98% Cable Reduction, Twisted Pair 4000 ft DTE to DCE
- LAN-based PC Control - Ethernet or Token Ring
- NetView PC or Cincom NetMaster Universal Workstations
- User-Controlled Database - dBase III PLUS or dBase IV
- Integral BERG/BERT and S.A.M. Test Functions
- 30,000 ports installed at RBOCs and Fortune 1000 Companies

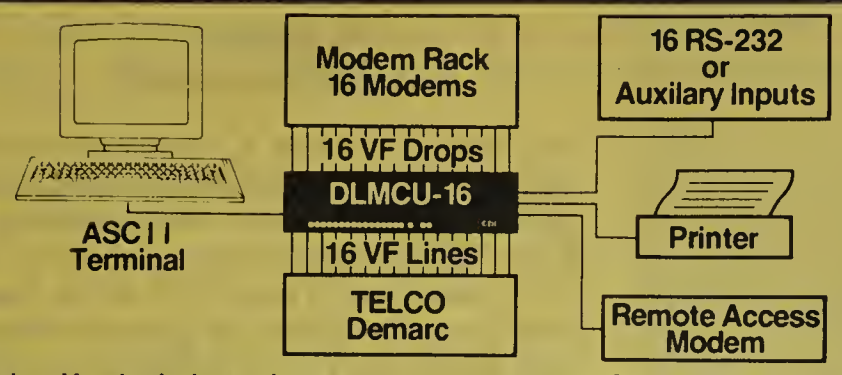
Datacomm Management Sciences Inc.

"The Responsive Ones"
Norwalk, CT 203-838-7183
FAX: 203-838-1751

Circle Reader Service No. 10

DIAL-UP MANAGEMENT

Dial Modem Management
for Small Networks



- Modem Vendor Independent.
- Auto Swap of RING NO ANSWER.
- Auto Busy Out of RING NO ANSWER.
- Start with 16 or less & Expand up to 128.
- Remote Site with Dial up Access.
- Real Time Trouble Reports.
- Daily Summary Reports.
- Low Cost Wrap Around.

CDI Communication Devices Inc.
One Forstmann Ct.
Clifton, NJ 07011
Phone: (201) 772-6997 Fax: (201) 772-0747

See us at Comnet Booth # 3105

Circle Reader Service No. 12

LAN AND WAN CONNECTIVITY

PLUG DIRECTLY INTO HIGH-SPEED DIGITAL SERVICES.

NEW

PROMPTUS® I
AT Bus-compatible WAN Adapter

On Board T1 CSU/DSU

- Provides fully integrated access to
  T1: 1.544 Mbit/s
  FT1: 56 to 1536 Kbit/s
  CEPT: 2.048 Mbit/s
  Primary Rate ISDN
  Switched 56 with T1 Access
- Greatly reduces network file transfer time.
- Includes X.25 file transfer software.
- Plugs into single 16-bit PC/AT slot.
- On board CSU/DSU eliminates external equipment, lowers costs.
- Applications include network gateways, routers, LAN bridges, facsimile servers, switches, graphic file transfer and more.
- Efficient shared memory interface.

Call or write for complete information:

PROMPTUS

Promptus Communications, Inc.
Portsmouth Business Park, Portsmouth, RI 02871
Tel: (401) 683-6100 FAX: (401) 683-6105

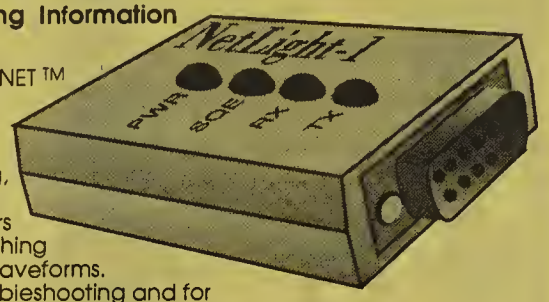
Circle Reader Service No. 2

ETHERNET LINE MONITOR

NetLight-1

ETHERNET ™ / IEEE 802.3
Attachment Unit Interface Line Monitor

- Provides On-Line Network Status Indication
- Provides Valuable Troubleshooting Information
- Easy to Install



NetLight-1 is a line monitor for the ETHERNET ™ or IEEE802.3 Attachment Unit Interface. It is available in two versions. Version A provides LED's that indicate when a station is transmitting, receiving, or experiencing a Signal Quality Error. Version B provides these same indicators and also provides connectors for attaching an oscilloscope to monitor the signal waveforms. This simple device is useful for both troubleshooting and for providing immediate feedback of network status to the station operator.

For Additional Information or to place your order for Netlight-1 please call 1-800-525-2141 or contact:

Knowledge Implementations, Inc.

32 Conklin Road, Warwick, New York, 10990 (914)986-3492 FAX (914)986-6441

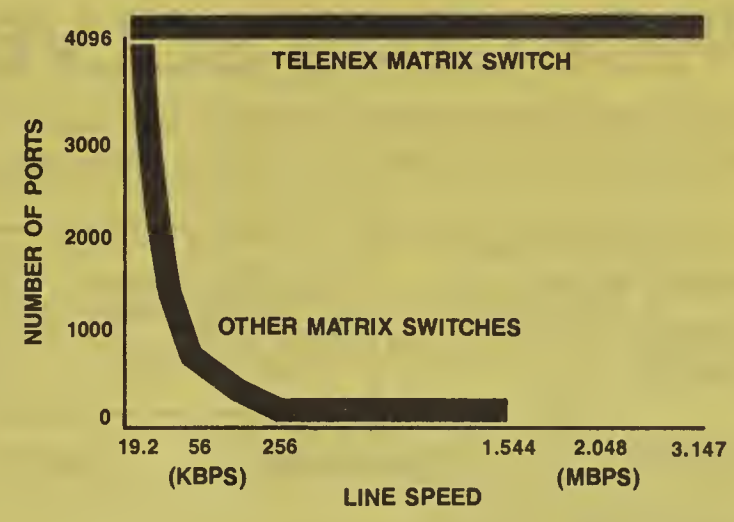
Dealer and OEM Inquiries Welcome
Quantity Discounts Available
Visa and MasterCard Accepted
In Stock for Immediate Delivery

Circle Reader Service No. 13

MATRIX SWITCHING

. . . TELENEX Matrix Switches

Speed and Capacity that Exceeds All Others



TELENEX CORPORATION
A UNIT OF GENERAL SIGNAL

(609) 234-7900 • TELEX 710 897 1648 • FAX (609) 778-8700
13000 MIDLANTIC DRIVE • MOUNT LAUREL, NJ 08054

Circle Reader Service No. 3

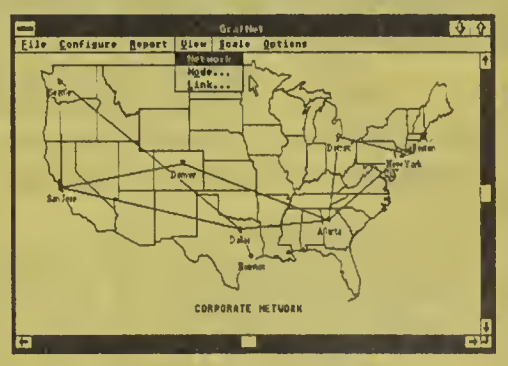
NETWORK PLANNING SOFTWARE

GrafNet provides instant visual displays of network topologies...

PC software allows easy viewing of network configurations.

Features

* Built-in database automatically converts Area code/Prefix to an on screen geographical location.
* Add and delete lines and nodes through user friendly Microsoft Windows interface.
* View topology nation-wide or on a state by state basis.
* Zoom in on a geographical area for closer viewing.



Applications

* Simplify mapping of voice/data networks.
* Create documents of network configurations for proposals and presentations.
* Create visual pictures of network topologies.
* Maintain a network configuration database.

Price $450

(408) 446-9598

Call today for information and free demo disk.

Network Dimensions, Inc.
5339 Prospect Road, Suite 122, San Jose, CA 95129

Circle Reader Service No. 4

Send For Free Info

NW Jan 90

For more information on any of the products and services advertised in *NetworkWorld's ActionCenter*, circle the Reader Service Numbers on this coupon which correspond to the advertisement of interest to you.

Complete the coupon information and mail to:
NetworkWorld
P.O. Box 5090, Pittsfield, MA 01203

(Expires 4/30/90)

Name _____
Title _____
Company _____
Phone ( ) _____
Street _____
City _____
State _____ Zip _____

NW Jan 90

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41
42 43 44 45 46 47 48 49
50 51 52 53 54 55 56 57

NETWORK SCANNING AND MONITORING

Cable Scanner

Pinpoint Network Cable Faults Fast!

The Scanner is a monitor, fault finder, cable locator and much more. Helps you pinpoint the location of shorts, opens or breaks. Its 32 character display reports the fault in plain English "short at 306 ft". With an oscilloscope, Scanner's high speed, pulse generating circuitry gives a detailed view of the entire LAN including transceiver, terminator and multiple faults.

* Cable length measurements
* Locate breaks, shorts, opens, bad crimps, etc.
* LAN activity monitoring
* Find cables in ceilings, walls, floors
* Cable TV troubleshooting
* Generate as-built drawings and specifications
* Isolate faulty network interface cards
* Very simple to operate

Included is Tracer for locating exactly where in the floor, ceiling, wall or patch panel the cable lies. Cable Scanner, Tracer and Operators' Manual are only $1495.

M-Test Equipment
P.O. Box 480008
San Francisco, CA 94148-0008

Call for info

Outside CA: (800) 334-4293
inside CA: (415) 861-2382
FAX: (415) 864-1078

Circle Reader Service No. 5

STRATUM 1 SOURCE

AUSTRON MODEL 3150

PRIMARY SYNCHRONIZATION

- **RELIABLE**
- **FLEXIBLE**
- **AFFORDABLE**

The Model 3150 Communications Network Synchronization System provides an independent on-site timing source for your telecommunication network. The 3150 gives you STRATUM ONE timing stability and accuracy in a broad variety of configurations. This system is used around the world in civil and military networks. Call today:

AUSTRON Inc.

a DATUM company

P.O. BOX 14766-EXIT 248, N. IH35 AUSTIN,TX 78761
TELE(512)251-2313/TWX(910)874-1356/FAX(512)251-9885

Circle Reader Service No. 6

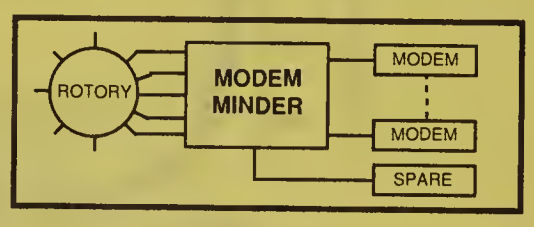
PREVENT HUNTGROUP LOCKOUT

Lost Calls = Lost $

RING - NO - ANSWER PROBLEMS SOLVED!

Dataprobe's Modem Minder detects failures in modem hunt groups and automatically takes corrective action.

Automatic Switching to Spare Modems or Busy-out Defective Modems.



Low Cost **Expandable** **Ideal for 800#s**

dataprobe INC.

170 COOLIDGE AVENUE
ENGLEWOOD, NEW JERSEY 07631
(201) 569-6464 FAX (201) 894-0939

Circle Reader Service No. 15

TESTERS

T1 monitoring in the palm of your hand.

- Unframed, SF and ESF formats
- Detect T1 errors and alarms
- Display DSO data and signaling bits
- Monitor audio on selected channel
- D3/D4, D1D and D2 compatible

$795

Circle Reader Service No. 7

Electrodata, Inc.
23020 Miles Road
Bedford Heights, Ohio 44128
Call Toll Free 1-800-441-6336
(216) 663-3333 TWX (810) 427-2280
FAX (216) 663-0507

SOFTWARE

Manage & Monitor Your

NOVELL®

Network

NEW

With **NETCOMPANION®**

NetCompanion is an integrated set of 16 unique network management & monitoring utilities designed for Novell Netware*.

Use NetCompanion to:
- Gather and graphically display network performance statistics
- Isolate network problems to a single workstation
- Control the server from the command line of your workstation
- Protect users from running applications improperly
- Solve a wide range of network management problems

Only $**349!**

Call **800-336-2014**
or **216-241-1140**

ETI Software
2930 Prospect Ave., Cleveland Ohio 44115

*Requires Novell Netware version 2.1 or above - Netware® Novell, Inc.

Circle Reader Service No. 16

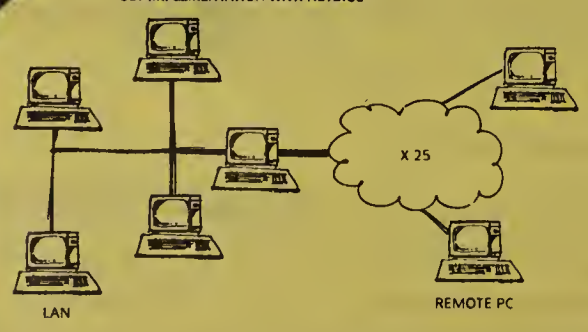
X.25 PC CONNECTIVITY

See us at Comnet Booth 1175/1177

ATTENTION LAN MANAGERS!

Are you operating NETBIOS within your LAN?

OST IMPLEMENTATION WITH NETBIOS



The PCXNet Card can *expand* the capabilities of your local area network. . .allowing a remote PC to connect to a LAN utilizing NETBIOS via an X.25 network interface. Developed by OST, PCXNet Card also provides advanced communications using CCITT X.21, X.25 and X.32. For a list of features provided by the PCXNet Card and other innovative products offered by OST, call today!

OST, Inc.
14225 Sullyfield Circle
Chantilly, Virginia 22021
(703) 817-0400

OST
Networking Intelligence

Circle Reader Service No. 17

NETWORKING MARKETPLACE

DATA COMMUNICATIONS

VSAT NETWORKS

VSAT BUYER'S KIT™

Join the legion of other network buyers worldwide who have taken advantage of the time and money saving potential of this unique document.

WHAT VALUE DOES THE VSAT BUYER'S KIT™ OFFER?

- Written by experts in VSAT network design and implementation. Covers data, video and voice VSAT networks.
- A rigorous and detailed procurement document that will protect you, the buyer, without eliminating any qualified vendors.
- A complete set of background information to provide the basic knowledge that you need in understanding VSAT networks and in preparing appropriate presentations for your management.
- Specific information regarding total life cycle cost, current VSAT users, consultants in the field, qualified vendors, and many other issues necessary to successful VSAT network planning and procurement.
- Potential savings of many thousands of dollars in both consulting fees and your staff time. Use your consultant as an advisor, not a paper mill.
- 267 pages of hard copy and on diskette in either WordPerfect or WordStar.

AVAILABLE ONLY FROM ICOM STRATEGIES.
FOR DETAILED BROCHURE CALL 407-259-5880.
See the FAXNeT Form on Page #51

PRICED AT $1,395.00
AVAILABLE FOR IMMEDIATE DELIVERY

ALSO FROM ICOM STRATEGIES
- ☐ Local Area Network Buyer's Kit™ (Future)
- ☐ Disaster Recovery Buyer's Kit™
- ☐ ISDN Buyer's Kit™ (Future)
- ☐ Video Conferencing Buyer's Kit™
- ☐ Network Management Buyer's Kit™ (Future)

ICOM STRATEGIES

478 Ballard Drive
Melbourne, Florida 32935

Telephone 407-259-5880

Comnet

Special Comnet Show Issue - February 5th

Closes: January 24th

Bonus Show & Hotel Distribution

Call for further information on advertising in this Special Issue.

NETWORK WORLD
Classified Advertising

Contact:

Joan Pinsky, 161 Worcester Road, Box 9172, Framingham, MA 01701-9172

Susan Egan, 18004 Sky Park Circle, Suite 100, Irvine, CA 92714

1-800-622-1108
East Coast: **508-875-6400**
West Coast: **714-250-3006**

RJE FOR PC's

Complete Bisync 2780/3780 and SNA 3770 RJE emulation for PC's and PS/2's. Execute batch jobs automatically to or from your IBM host in JES2/3. Featuring...

- IBM Mdl 3777-1 support
- Up to 19.2K bps thruput
- Unattended operations
- Printer, card punch and console support
- Data compression and transparency
- PC-to-PC connectivity

Full warranty • *Immediate delivery*

From as *low as* $249
Call (800) 767-4844 today!

Attn: End Users

Upgrading Your Equipment?

Sell your present system through an ad in Network World.

Write Or Phone: Network World, Classified Advertising

Joan Bayon Pinsky,
161 Worcester Road, PO Box 9172,
Framingham, MA 01701-9172;
1-800-622-1108 (in MA 508-875-6400)

Pacific & Mountain:
Susan Egan, 18008 Sky Park Circle,
Suite 145, Irvine, CA 92714;
714-250-3006

CONCORD DATA SYSTEMS

Dial Modem Sale

212 Autodial
224 S I Autodial
V.32 Trellis
296 Trellis

CALL FOR LOW PRICES

508-681-0600
Ext. 2021 or 2017

SELL OR TRADE YOUR SURPLUS
modems, mux's, data pbx, etc.

REPAIRS • UPGRADES • INSTALLATION • CABLING

MICOM codex
paradyne AT&T
IBM Racal-Milgo
ARK CASE Datatel
Universal Data Systems
General DataComm

NEW AND USED EQUIPMENT BACKED BY WARRANTY
NATIONWIDE SERVICE, MAINTENANCE AND INSTALLATION

we need to buy
- ***TIMEPLEX MULTIPLEXORS***
- ***UDS 208 AB MODEMS***
- ***CODEX 208 AB MODEMS***
- ***MICOM BOX 2 MUX'S***
- ***GDC MEGA SWITCH***

call us...

(201) 586-3070 FAX 586-3080

Warwick DATA SYSTEMS, INC.
66 FORD ROAD, DENVILLE, NEW JERSEY 07834

TRAINING

GET THE BEST LAN TRAINING *ANYWHERE!*

3Com® NOVELL® BANYAN®

FROM ptxi EDUCATION CENTERS

Austin - Chicago - Dallas - Denver - Houston - San Antonio
Los Angeles - New York - Reston, VA - San Francisco

1-800-783-PTXI

See the FAXNeT Form on Page #51

Mention this ad and get. . . **$100 DISCOUNT** on Registrations Paid Before March 30, 1990.

TELETUTOR
LAN Course
The best computer-based training in the business

TELEtutor®

TELECOMMUNICATIONS TRAINING SERIES
For FREE catalogue of all our courses call
800-542-2242
(603) 433-2242

The following advertisers appear on the FAXNeT form on page #51:

ICOM
PTXI
Teletutor
VOICE 90
Warwick Data Systems

Network World
First Quarter 1990
Editorial Features

Jan 15 - Telecom Services Buyer's Guide: Cellular Services - Bonus Distribution: ICA Winter Conference

Jan 29 - Datacom Buyer's Guide: Videoconferencing Systems

Feb 5 - Network World Salary Survey Bonus Distribution: Communication Networks

Feb 12 - 4M & 16M Token Ring Performance - Bonus Distribution: NetWorld Boston

Feb 19 - Telecom Services Buyer's Guide: 900 Series

Feb 26 - Trends and Technologies Reshaping Networks: Higher Bandwidth Needs

Mar 5 - Telecom Buyer's Guide: T-1 and T-3 Multiplexers

Mar 12 - Datacomm Buyer's Guide: Network Design Software - Harvey Study Issue

Mar 19 - Telecom Services Buyer's Guide: BOC Centrex Offerings

Mar 26 - Bridging 4M & 16M Token LANs

How To Create a 24 Hour-A-Day Business Without 24 Hour-A-Day People!

Unlock the potential of your telephone at VOICE '90. Using simple voice processing products, and touch-tone inputs, your phone system can now:

- ***Automate sales, order entry and customer service calls.***
- ***Deliver information to multiple destinations with one phone call.***
- ***Accept and verify credit card purchases automatically.***
- ***Use voice mail boxes to communicate 24 hours a day.***
- ***Access vital information from any database.***
- ***Allow customers to route their own calls.***

VOICE '90 delivers 33 conference sessions, ten tutorials and a 60,000+ sq. ft. exposition hall, where you will see hundreds of the most innovative applications in call processing and voice processing — all designed to save time and money and increase productivity. Test all the newest equipment and services under one roof. Walk away with the latest cost-saving and productivity applications of these exciting new technologies.

Attend The Third Annual

VOICE '90

Conference & Exposition

Anaheim Convention Center
March 28 - 30, 1990
(Tutorials...March 27)

The largest applications showcase in the world for voice and call processing products, systems, applications, service and technologies. To receive more information or to register, call

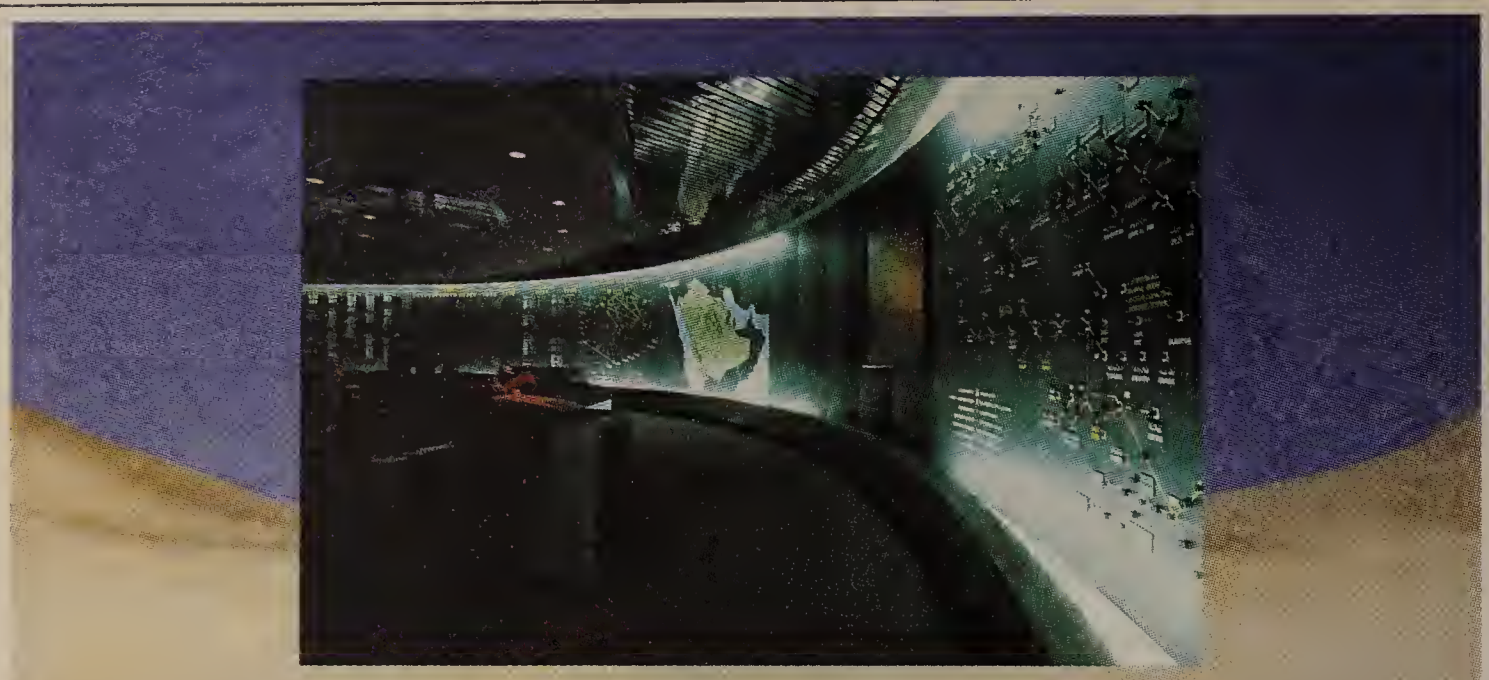
1-800-888-2188

See the FAXNeT Form on Page #51

NET-J

VOICE '90 — Information Publishing Corp. • P. O. Box 42382 • Houston, Texas 77242 • 713-974-6637 • Fax: 713-974-6272

NETWORKING CAREERS



Culture Shock.

The technological advancements of SAUDI ARAMCO (Saudi Arabian Oil Company) are quite impressive: As the free world's largest producer and exporter of oil and gas, and the manager of a fourth of the globe's proven oil reserves, Saudi Arabia has been challenging the experts for more than 50 years.

These technical achievements have been made in part with the international team of expatriates that are part of SAUDI ARAMCO's 44,000-member work force. Expatriates to play an important role by contributing their expertise, they not only import new technology into Saudi Arabia, but also benefit from once-in-a-lifetime work experiences.

Opportunities are available for the following communications professionals:

MICROWAVE ENGINEERS & TECHNICIANS

MOBILE RADIO ENGINEERS & TECHNICIANS

OUTSIDE PLANT ENGINEERS & TECHNICIANS

Requirements include 7-10 years' experience in telecommunications engineering or maintenance. Responsibilities will include both analog and digital microwave radio and multiplex equipment (GTE Lenkurt and NEC). Assignments will include support to network rearrangements, installation and maintenance of digital and analog microwave fiber optics systems, VHF/IJF radios, and outside cable plants.

Employment with SAUDI ARAMCO will provide you with an interesting lifestyle in a multicultural environment, including comfortable family living arrangements, free medical care while in Saudi Arabia, fine schools and a broad spectrum of recreational opportunities, plus 36 calendar days of vacation annually, allowing for extensive travel. We provide an attractive compensation package which includes an expatriate premium.

Please send your resume/salary history, indicating area of interest, to: **ASC, Employment Dept. 06X-T06-0, P.O. Box 4530, Houston, Texas 77210-4530.**

SAUDI ARAMCO

World Class Opportunities.

The School of Public Policy seeks candidates for the Southern Bell Professor of Telecommunications Policy.

Candidates are sought with combinations of industry, government, and university teaching experience. Competitive salary.

Georgia Tech is a unit of the University System of Georgia and an AA/EO employer.

Contact Professor John Havick, School of Social Sciences, Georgia Institute of Technology, Atlanta, Ga. 30332-0345

For Information On Advertising In Network World

Call Barbara Hill at 1-800-622-1108 (in MA 508-875-6400)

NEED HELP?

Guess which newspaper was voted "most helpful" in the latest TCA Member Profile Study?

You guessed it - Network World.

And you'll find Network World "most helpful" when you have to hire networking professionals.

Network World, the Users Choice, delivers to your target audience every week.

Over 70,000 qualified networking professionals with an estimated pass-along readership of 230,000 every week.

Minimize your recruitment expenditures while maximizing your recruitment responses.

For more information, or to place your recruitment ad in Network World, call Barbara Hill at 800-622-1108 (in MA call 508-875-6400)

Voice/data.

Ohio University's J. Warren McClure School of Communication Systems Management seeks a tenure-track assistant professor.

The focus of our nationally recognized undergraduate program is on quality education and professional involvement for faculty and students. The person we seek should have research interests related to voice/data networks and/or professional experience in management and design of voice/data networks plus interest and skills in teaching in a combination of areas, including traffic analysis; financial analysis in telecommunications; project management and implementation. Master's or other appropriate terminal degree desired; earned PhD or teaching experience a plus. Nine-month position beginning September 1, 1990. Salary commensurate with experience. Summer teaching possible. Ohio University provides a wide range of benefits, including family educational benefits. Send letters of application, resumes, transcripts, and three letters of reference no later than March 15, 1990, to:

Search Committee, J. Warren McClure School of Communication Systems Management, 197 RTVC Building, Ohio University, Athens, Ohio 45701.

Ohio University is an Affirmative Action/Equal Opportunity Employer.

You can target your recruitment advertising with Network World

Network World is the first and only publication written specifically for communications users.

That means you'll reach the specialized and qualified applicants you want.

Over 70,000 communications professionals subscribe to *Network World* with an estimated pass-along readership of 230,000 every week.

One of them could be exactly who you're looking for.

For information on placing your recruitment ad, call toll free at **800-622-1108** (In MA **508-875-6400**)

Are you looking for...

Data Communications Managers?
Telecommunications Managers?
Telecommunications Engineers?
Network Managers?
Systems Analysts?
Telecommunications Analysts?
Transmission Managers?
Data Communications Consultants?
Systems Engineering Managers?
Directors of Information Services?
Senior Satellite Systems Engineers?
Project Leaders?
Telecommunications Network Planners?
Manager Voice Communications?
Systems Network Programmers?
Factory Communications Managers?
Communications Networks Specialists?
Group Datacommunications Sales Managers?
Project Engineers/Network Development?
Telecommunications Software Programmers?
Senior Datacommunications Specialists?

Network World delivers your recruitment message to 70,000+ networking communications professionals every week. And these are the readers who voted Network World "The most helpful publication" in the TCA September 1988 Members Survey.

To get your recruitment message in Network World call Barbara Hill at 800-622-1108 (508-875-6400 in MA)

FAXNeT is a service designed to help readers of *Network World* gather important information via FAX on products and services advertised in *Network World*.

This week's FAXNeT ADVERTISERS

Company — Page

ACC.....61
Fax: 805-962-8499

Andrew Corp. 18
Fax: 708-349-5943

Cabletron.....8
Fax: 603-332-4616

Emulex.....12-13
Fax: 714-241-0792

Farallon Computing.....64
Fax: 415-841-5770

FTP Software 24
Fax: 617-246-0901

General Datacomm.....17
Fax: 203-758-8507

ICOM 47
Fax: 407-242-0014

IDG/Comnet.....41
Fax: 508-872-8237

Micom Systems 57
Fax: 805-583-1997

Ntwk Mgmt Solutions.....62
Fax: 508-872-8237

PTXI 48
Fax: 708-358-8927

RAD Data Comm.....20, 43
Fax: 201-587-8847

Rybs Communications.....58
Fax: 303-449-9259

Simpact.....56
Fax: 619-565-4112

SynOptics 37
Fax: 415-967-8710

Teletutor.....48
Fax: 603-431-0776

10Net Communications 5
Fax: 513-434-6305

Universal Data Systs.....10
Fax: 205-721-8926

VOICE 90 49
Fax: 713-974-6272

Warwick Data Syst.....47
Fax: 201-586-3080

Western Digital.....3
Fax: 714-863-9326

How to Use FAXNeT

Listed below in the FAXNeT Directory are the FAX numbers of participating advertisers in this week's issue of *Network World* and the page number where the ad appears. To use FAXNeT cut out the FAXNeT form and make a copy of the form for each inquiry you want to make. Then just FAX it to the vendor's number listed in the FAXNeT Directory.

Benefits to the *Network World* Reader

FAXNeT is designed to get you product and service information FAST. And, if your request is urgent and requires an immediate response from the vendor just check the "Urgent" Box.

NETWORK WORLD

FAXNeT

Attention: Marketing Communications Manager

Subject: This inquiry was generated by a *Network World* reader who is responding via FAX to your advertisement in *Network World*.

Name _____ Title _____

Company/Div _____

Address _____

City _____ State _____ Zip _____

Phone _____ FAX _____

☐ URGENT

Action Requested
- ☐ Request for Sales Call
- ☐ Request for Proposal
- ☐ Request for Information

Purchase Timeframe
- ☐ Within 60 Days
- ☐ Within Six Months
- ☐ Within One Year

Scope of Purchase Responsibility
- ☐ Enterprise Wide
- ☐ Departmental

Purchase Influence/Number of Sites
- ☐ One Site
- ☐ 2-9 Sites
- ☐ 10-20 Sites
- ☐ 21+ Sites

Product Advertised: _____

_____

Intended Application: _____

_____

_____

(continued from page 43)
variation of conventional packet switching they are calling fast packet switching. This technique uses the same frame relay data format as conventional packet switching and is used at or below T-1 rates. Frame relay is based on the Logical Link protocol that handles procedures for the ISDN D signaling channel, known as Link Access Procedure D (LAP D).

Cell-relay switching

Although it is not commercially available yet, some industry observers are referring to a new type of packet switching, which replaces the frame relay technique with a cell-relay methodology, as the "real" version of fast packet switching. Cell-relay fast packet switching uses asynchronous transfer mode switching.

"The development of fast packet switching is a natural progression from where we are now," says Stig Persson, engineering principal at Infotron Systems Corp. in Cherry Hill, N.J. "Over the next five years or so, networks will evolve to higher bandwidths and a mixture of circuit and fast packet-switched configurations. Synchronous transmission technologies like SONET are the natural way to carry fast packet-switched information."

More than just a variation of conventional packet switching, cell-relay fast packet switching actually represents a new architecture. It divides different types of signals into 48-byte packets of identical size and format before they are transmitted, allowing true integration of digital voice, data and video on a common medium. Frame relay packets vary in size from 128 to 1,500 bytes.

Cell-relay fast packet switching achieves higher speeds than traditional TDM and avoids the delays of conventional packet switching because each voice, data or video input channel is allocated its own packet, and a packet fills an entire frame on a trunk.

Thus, fast packet-switching multiplexing can be achieved by interleaving packets, rather than interleaving channels within frames, as in traditional TDM. A faster clocking performance — hence the term fast packet — allows the transfer of millions of packets per second.

Fast packets contain control information for addressing with error detection/correction so that each packet can self-route through the network. This eliminates delays that occur when traditional TDM nodes signal one another to agree on how to assign the interleaved portions of a frame to multiple channels. It also allows circuit bandwidth to be assigned dynamically and instantaneously, based on the number of packets built and transmitted.

As packets travel through a network, processing is done on the end nodes but not on the network itself. "No software processing is required for individual packets because, in effect, all the switching is done in the hardware," BELLCORE's Ritchie says.

Rerouting times on fast packet networks will be up to 10 times faster than TDM networks in equivalent topologies. Fast packet switching's virtual circuit orientation allows all packets destined for a particular address or port to traverse the same path, or virtual circuit, eliminating problems of packet sequencing at the receiving end.

"Frame relay is the technology that most people say is really for transmissions at 2M bit/sec and under," says Jim Herman, a principal of Northeast Consulting Resources, Inc. in Boston. "Cell relay starts at 50M bit/sec and goes up to 400M bit/sec. It is the technology of [broadband ISDN] and metropolitan-area networking."

Metropolitan-area nets

Until broadband ISDN WANs become available in the mid-1990s, the IEEE 802.6 standard for metropolitan networks, known as DQDB, will provide an intermediate technology that has been called bridge-to-broadband networking. Although broadband ISDN is intended for wide-area communications, the 802.6 metro-area net standard is very similar to broadband ISDN.

Unlike broadband ISDN, 802.6 is media-independent and does not use asynchronous transfer mode switching. However, it is fiber-oriented and is based on the cell-relay data format. The 802.6 and broadband ISDN standards committees are attempting to maintain compatibility between the two so that 802.6 can be used to provide seamless connection to packetized broadband ISDN.

A draft of the 802.6 standard should be completed by this spring, according to James Mollenauer, chairman of the IEEE 802.6 metro network committee and principal technical consultant for Prime Computer, Inc. in Framingham, Mass.

"The [broadband] ISDN committee is recommending 802.6 as the way to divide up bandwidth on broadband ISDN," Mollenauer says. "It turns out we have some excellent compatibility there — the 802.6 segment size is exactly the size of the segments needed for [broadband] ISDN. We will be able to take the segments from a metropolitan network and drop them right into [broadband] ISDN. This represents a convergence of metropolitan-area networks and WANs."

Metropolitan-area networks are standardized, discrete networks for voice, data and video transmissions that can multiplex LANs onto a single high-speed fiber.

They provide LAN-to-LAN and LAN-to-WAN connections for nodes on public or private LANs that are located on noncontiguous properties within a metropolitan region. Metropolitan-area networks offer high throughput, low delay, a higher degree of connectivity and lower costs because users share backbone transport and switching systems.

Although the 802.6/DQDB standard was intended to operate at SONET speeds,

(continued on page 56)

Gateways to Knowledge

SUPERCOMM® ICC '90

SUPERCOMM® '90 Conference and Exhibition
1990 International Conference on Communications

Georgia World Congress Center
Atlanta, Georgia
April 16 - 19, 1990

SUPERCOMM® '90 and the International Conference on Communications open the gateways to telecommunications knowledge for you. This conference and exhibition is the world's largest telecommunications event in 1990, and it's absolutely packed with information and products.

You'll have the opportunity to attend 130 sessions — 50 free. Listen to internationally respected industry professionals. Visit 450 exhibits. Examine thousands of products. Network with peers. Hear the latest industry news and views from DEC Chairman Ken Olsen, a special AT&T program, and a carrier/user forum by *Telephony* and *Network World*. Tour the SUPERHOME and SUPEROFFICE of the future. And get the facts on the most up-to-date technical, operational, and management issues.

Here you'll find more diversity than ever before because the SUPERCOMM '90 Conference and Exhibition is co-located with ICC '90. Renowned for its high-caliber technical programming, ICC brings you a wealth of information under the theme: "Communications — Foundation for the 21st Century."

Attend SUPERCOMM '90 and ICC '90 to step into the future. And to get a step ahead in your career. Call today!

USTA United States Telephone Association

For registration forms and non-technical programming:
United States Telephone Association
900 19th Street, N.W., Suite 800
Washington, D.C. 20006-2105 USA
Phone: (202) 835-3100
Fax: (202) 835-3248

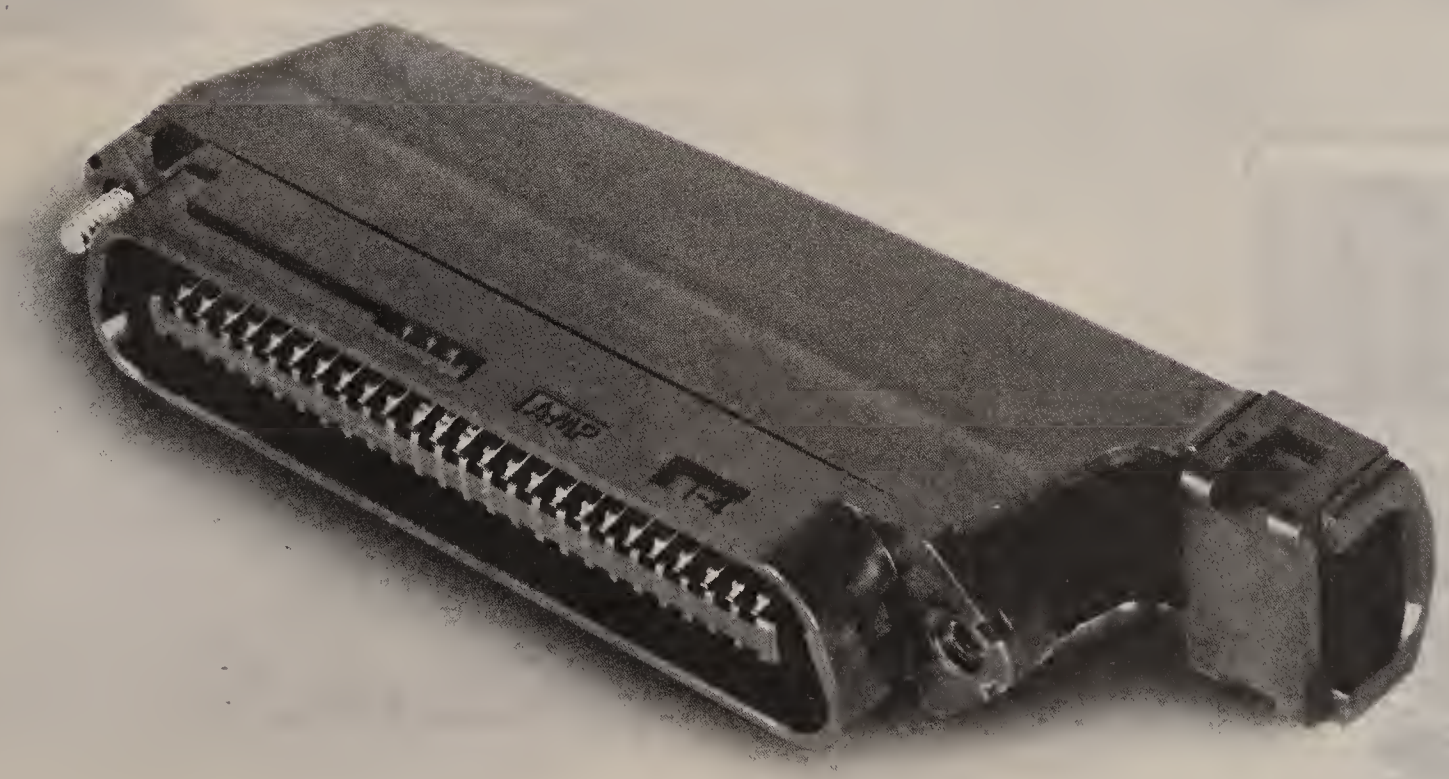
TIA Telecommunications Industry Association

To exhibit:
Telecommunications Industry Association
150 N. Michigan Avenue, Suite 600
Chicago, IL 60601-7524 USA
Phone: (312) 782-8597
Fax: (312) 782-3617
Telex: 595236 USTSACGO

COMSOC

For technical programming:
International Conference on Communications
c/o Southern Bell
675 West Peachtree Street, N.E.
Room 24N73
Atlanta, GA 30375 USA
Phone: (404) 529-7630
Fax: (404) 522-7665

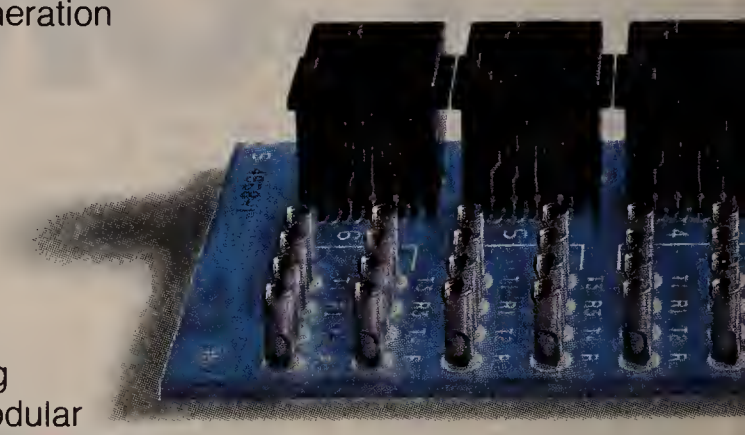
FOR YEARS, OUR NAME STOOD FOR QUALITY CONNECTORS.



TODAY, IT
FOR A WHOL

FDDI connectors and fiber-optic modules provide current applications of next-generation technology.

Interchangeable connector inserts accept equipment from any major vendor, allowing in-office or wiring closet changes in seconds.



Uncomplicated wiring management: our modular cross-connect allows simple "jumper" reassignment for twisted pair voice and data.

Today, you'll find AMP technology every place you look in the networking environment. In fact, we provide and support complete premises wiring packages for any network, regardless of media mix or vendor mix. And we simplify wire management at the same time.

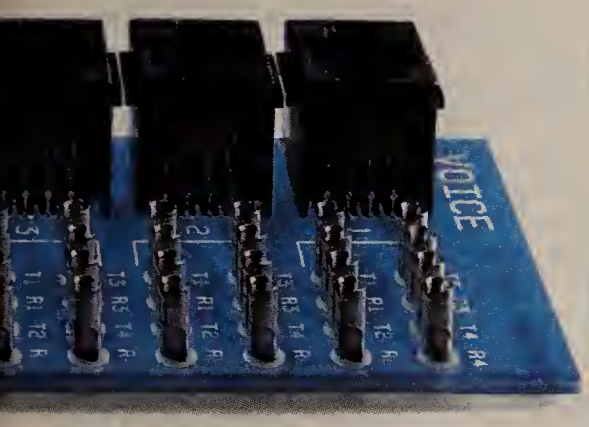
At the desk, our communications outlets adapt to changing equipment with a quick module replacement. In the wiring closet, our twisted pair, coax, or fiber-optic systems reconfigure in seconds.

From network-specific cabling to complete fiber-optic systems, our products reflect our OEM-level involvement with the world's major vendors. They simplify change and growth in your network, and offer the inherent ability to accommodate next-generation technologies.

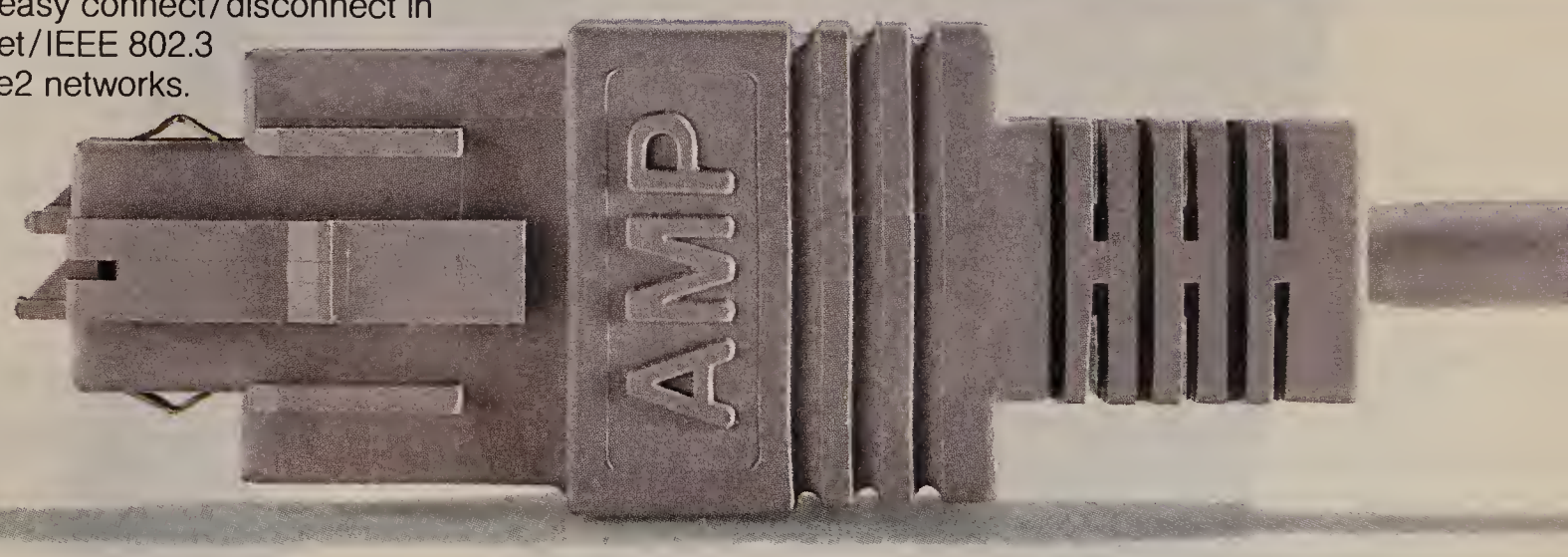
STANDS E LOT MORE.

AMP baluns simplify the interface between coaxial and twisted pair cabling.

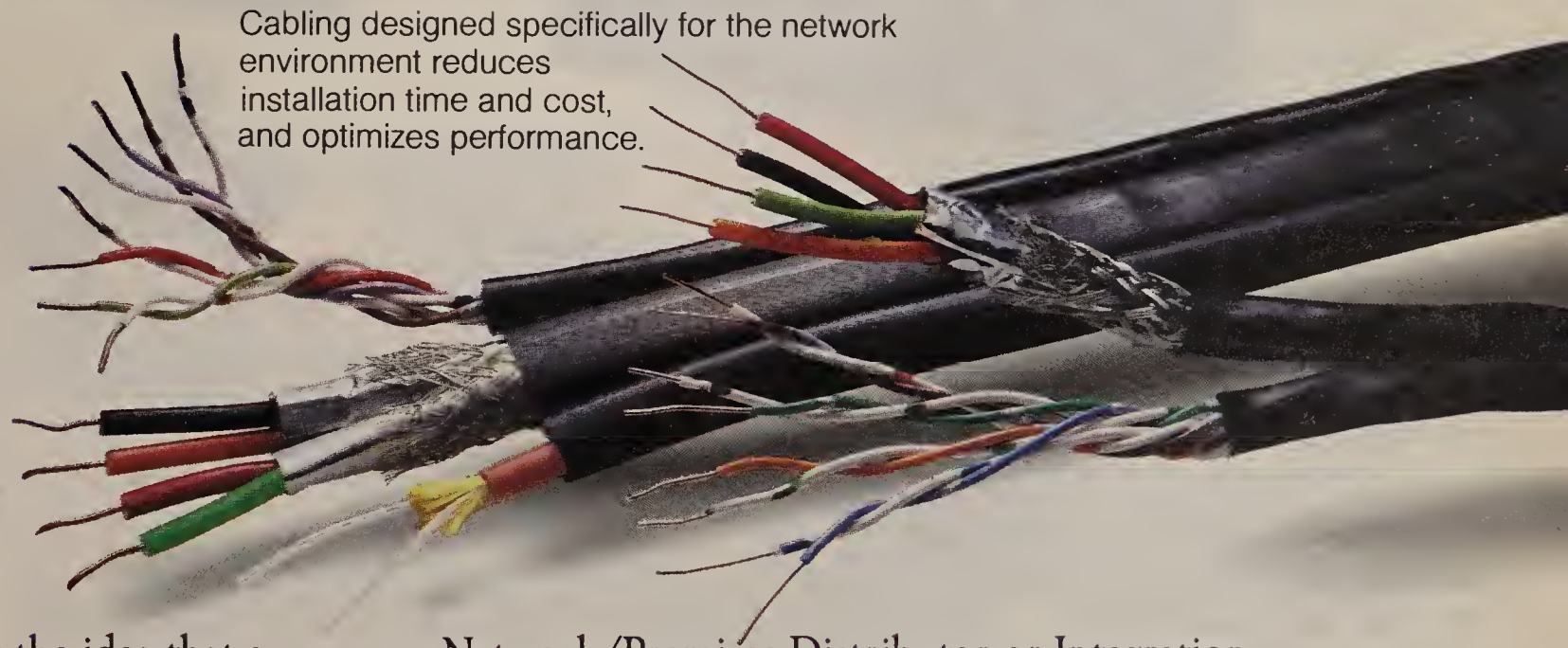
Undercarpet power, phone, and data wiring allows quick access and change, with minimal work disruption.



Our Thinnet Tap System features self-shunting connections for quick, easy connect/disconnect in Ethernet/IEEE 802.3 10Base2 networks.



AMP standard and special-purpose patch panels reduce wiring closet complexity, and speed change.



Cabling designed specifically for the network environment reduces installation time and cost, and optimizes performance.

Today, our name stands for the idea that a network should be robust at its most fundamental level — and that premises wiring should be as advanced as the hardware it supports.

For more information and the name of the AMP Network/Premises Distributor or Integration Partner near you, call our Product Information Center at 1-800-522-6752. AMP Incorporated, Harrisburg, PA 17105-3608.

THIS IS AMP TODAY. **AMP**

Meganets

continued from page 52

early versions of the standard will accommodate DS1 and DS3 rates so that the first metropolitan-area networks, which are being set up by public carriers, will be compatible with existing copper wire telephone company networks.

The first private metro nets probably will be operated by large corporations at SONET's OC-3 rate, although in the future, metropolitan-area networks will be capable of operating at multigigabit speeds.

802.6/DQDB will support data, video and fixed bandwidth transmissions for digital voice. It will eventually support FDDI and channel-to-channel IBM mainframe communications as well. FDDI is a competing standard for private metropolitan-area networks, but it is not likely to be used on public metro nets because its 100M bit/sec speed is not compatible with public carrier rates and FDDI Phase 1 does not provide fixed bandwidth for voice. FDDI 2 will provide fixed bandwidth but will not be compatible with FDDI 1.

Like FDDI, 802.6/DQDB uses a dual-ring configuration, but logically, it acts as a dual bus. Because it runs on a dual ring in both directions simultaneously, at OC-3 rate, 802.6/DQDB operates at twice the 155M bit/sec rate, or 310M bit/sec.

Delays that can occur while users wait for a token to come around on token-based systems such as FDDI could, under light loading conditions, become quite lengthy on metropolitan-area networks that extend for many miles.

"FDDI is basically a LAN," Mollenauer says. 802.6/DQDB avoids this problem by allowing a user to transmit a message in one direction by simply sending a reservation in the opposite direction.

DQDB was developed by QPSX Systems, Inc., an Australian company, and has been adopted by the AT&T Network Systems Group. To avoid having their local loops bypassed by private metropolitan networks, the regional Bell holding companies are pushing their own DQDB-based service, called SMDS.

SMDS is a 45M bit/sec, packet-switched, asynchronous transfer mode service that can accommodate LANs, private branch exchanges, fast data transfer, virtual private networks and metropolitan-area networks. The RBHCs are experimenting with it now and plan to begin offering SMDS gateways to metro nets in major cities later this year.

Although SMDS does not offer fixed bandwidth for voice, it adds address filtering, a technique that uses dedicated interfaces to ensure privacy as users' messages traverse a shared metro net backbone. Also available, for a fee, is a guarantee of access to a specified amount of bandwidth at all times, regardless of the traffic load on the metropolitan network.

To subscribers, SMDS will appear to be a subnetwork of their own LANs. They will be able to access SMDS by installing a board with a dedicated SMDS 802.6 standard interface on their equipment.

As broadband networking continues to evolve, its appeal to managers of high-traffic nets increases. Harried net managers may finally breathe a sigh of relief when the technologies, switching techniques and standards that are vital for broadband communications are up and running.

Puzzled about how to connect your MicroVAX to a Token Ring?

We make it simple. Just plug it in.

It's revolutionary.

Simply plug one of Simpact's TCI 2000 Series Interfaces into the backplane of your MicroVAX, and you can connect it directly to an IBM Token Ring. It's that easy.

Everyone wins. Users on the Ring gain immediate access to the power of the MicroVAX. Users on the MicroVAX easily access the information and computing resources on the Ring. And a single-board TCI 2000 Series Interface provides all of the hardware and software you'll need.

A complete hardware solution

With its own 68020 microprocessor and up to 2 megabytes of local memory, the TCI 2000 board serves as a powerful front-end communications processor. It performs all compute-intensive protocol processing, allowing the MicroVAX to remain dedicated to other critical applications. And the TCI 2000 provides interfaces to both 4-Mbit and 16-Mbit Token Rings.

A complete software solution

As part of its TCI 2000 Series, Simpact offers a variety of communications protocols commonly used in Token Ring environments.

Systems integrators, applications developers, and end users can choose from protocols that include 802.2 LLC for simple station-to-station transactions; TCP/IP for complete user services, such as terminal emulation and file transfer; and IBM-compatible NetBIOS and LU 6.2 for program-to-program communications.

If connecting your MicroVAX to a Token Ring has been puzzling you, call us. We've got the piece you've been missing.

simpact

See the FAXNeT Form on Page #51

Simpact Associates, Inc., 9210 Sky Park Court, San Diego, CA 92123, 619-565-1865

MicroVAX is a trademark of Digital Equipment Corporation.
IBM is a trademark of International Business Machines Corporation.

Global users eye trans-Soviet link plan

continued from page 26

Denshin Denwa, Ltd. of Japan, Societa Finanziaria Telefonica of Italy, British Telecommunications PLC, the Office of Telecommunications of Australia, Telecom Denmark and Great Nordic Telegraph Co. of Denmark, the Deutsche Bundespost Telekom of West Germany and the Ministry of Posts and Telecommunications in the Soviet Union.

However, the group may run into some problems winning the U.S. Department of Commerce's approval for an export license for the sophisticated fiber-optic transmission technology that would be needed for the project.

The consortium is expected to apply for that license this month.

Exports to the Soviet Union and Eastern Bloc countries are evaluated for their national security implications and must pass reviews by the U.S. State, Commerce and Defense departments, as well as the 17-nation Coordinating Committee on Multilateral Export Controls, based in Paris.

Although Commerce Secretary Robert Mosbacher has said he may consider loosening restrictions on exports to Hungary and Poland, he has not been as amenable to proposals for technology exports to the Soviet Union.

Net helps police

continued from page 25

tification of people and belongings," Cole said.

Piecing together evidence in the Pan Am 103 bombing is somewhat like putting together a jigsaw puzzle with pieces strewn all over the world, said Chief Inspector David Iles of the Strathclyde Constabulary, former computer chief in the Lockerbie investigation.

The bombing, which killed 259 passengers and crew aboard Flight 103 and an additional 11 people on the ground, spread bodies and plane fragments over 850 square miles of Northern England and Scotland. In the ongoing investigation into the incident, allied police forces have conducted more than 15,000 interviews in 13 countries and have made inquiries in nearly 40 other countries.

"In days gone by, this sort of activity was carried out by a card index," Iles said. "It would have been very difficult to keep track of a card index with so much volume and updating."

CHOOSE MICOM®

WE'LL HELP YOU MAKE THE MOST OF YOUR NETWORK

For information about MICOM products, check the appropriate box and drop this postage-paid card in the mail today.

☐ **Voice/Data** — Including Voice Digitizers and Statistical and Time-Division Multiplexors that transmit voice and data over the same line. Incorporate voice in your network practically free!

☐ **X.25** — Including PADs, Packet Switches, Communications Processors and Protocol Converters, along with a choice of powerful Network Management programs.

☐ **Multiplexors** — Including our new Fast Stat Mux, Integral Modems and ISUs, Concentrator Switches, and a variety of size and operation options, including Sync/Async, Wideband and Multidrop.

☐ **INSTANET** — Including Ethernet Gateways, Data PABXs and Local Data Distribution Products, along with menu-driven Switch Management and PC-to-PC Networking programs.

☐ **General Product Catalog**

For additional information or inquiries, call our Toll-Free Applications Hotline.

1-800-MICOM US

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY/STATE/ZIP _____

PHONE ( ) _____ EXT. _____

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 906 SIMI VALLEY, CA

POSTAGE WILL BE PAID BY ADDRESSEE

MICOM Communications Corp.
4100 Los Angeles Avenue
Simi Valley, CA 93063-9949

GET GAB AS A GIFT.

Cut phone bills with our new integrated data/voice MUX.

Voice-grade line tariffs are going up, while 56K digital tariffs are coming down. That makes room for some serious savings by calling over digital lines instead of regular phone lines.

At the same time, packing more onto your digital lines can eliminate separate data and voice lines.

And all you need to make this happen is our newest integrated data/voice multiplexor, the VoiceMux™ 100.

It saves most companies enough, they tell us, to pay for itself inside of six months. From then on, the gab's a gift.

With T1-like performance, the VoiceMux 100 gives you digital speech without any drop-off in voice quality.

But the VoiceMux 100 isn't the only way MICOM can save you phone money. We've developed a whole family of readily upgradable, ever-expandable data/voice equipment.

With our Stat V statistical MUX, for instance, you can economically send data or voice over any leased line that operates at 9.6 Kbps or faster.

Or you can add digital voice to your existing equipment with our APV 1, cutting dial-up and tie-line expenses.

If all this sounds good, there's one more thing you should hear. Our outstanding voice quality. For a **live demonstration** of our advanced packetized voice technology, just call **1-800-MICOM US.**

After that, you're likely to be calling digitally.

(805) 583-8600
FAX (805) 583-1997

MICOM®
NETWORKING SOLUTIONS

See the FAXNeT Form on Page #51

HP to unveil network control package

continued from page 2

run on top of the server software and let users manage multivendor devices on Transmission Control Protocol/Internet Protocol nets. HP said it is developing another OpenView application that will enable users to monitor and control multiple remote HP 3000 minicomputers.

In addition, HP is releasing its OpenView architecture specifications to enable developers and users to build applications that will run on top of OpenView Network Management Server.

Analysts said the announcements, which were expected since last fall ("HP preps Unix-based integrated OpenView," *NW,* Oct. 23, 1989), are helping HP keep pace with its major integrated network management system competitors — IBM, Digital Equipment Corp. and AT&T — all of which have announced products.

"Basically, HP had to do something," said Paul Li, a senior consultant with Ernst & Young's Network Strategies, Inc., a Fairfax, Va.-based network consulting practice.

IBM already has NetView, which provides net management for IBM and non-IBM devices. DEC recently fleshed out its Enterprise Management Architecture by announcing a net management console called DEC Management Control Center (DECmcc) Management Station and DECmcc Director software that will collect data from disparate devices tied to DECnet.

AT&T has delivered products under its Unified Network Management Architecture, including an early version of Accumaster Integrator software that integrates data from multiple net management systems on an Accumaster Consolidated Workstation.

Frank Dzubeck, president of Communications Network Architects, Inc., a Washington, D.C. consultancy, said, "This is a strong announcement for HP, just as DEC's recent announcement was big for it." But since neither HP's OpenView Network Management Server nor DEC's DECmcc Director have shipped, it is hard to judge their performance.

OpenView Network Management Server consists of four modules. The core module, called the Communications Infrastructure, directs the flow of data between the other three, called OpenView Event Management Services, OpenView Data Management Ser-

(continued on page 62)

Six reasons why AMS is the only DOS extension that networks.

AMS™-Advanced Memory Specification from RYBS Electronics is the only DOS extension technology available that works with *any* DOS computer and insures that *all computers in the network are immediately compatible.*

With one megabyte of total memory, only 640KB is typically usable for general operations (DOS). And in network systems, this limited memory is rapidly used up. AMS HIcard products activate the dormant, unused memory space within the computer system. The 640KB DOS limitation disappears and up to 928KB of real DOS memory is accessible to use for all networks, Config.sys files, application software and devices.

All AMS HIcard products maximize versatility and profit potential three ways:

- AMS effectively extends DOS memory for the complete line of microcomputers, PC, XT, AT, 386, 386 Microchannel and PS/2 systems.
- AMS is inexpensive, easy to install, simple to use and requires minimal support.
- AMS is fully compatible with all software, hardware and extended/expanded memory boards.

Call 1-303-444-6073 today for your free, detailed AMS information package featuring the complete line of AMS products.

RYBS ELECTRONICS

P.O. Box 4521
Boulder, CO 80306
FAX: 303-449-9259

"Make Your Token Ring LAN Sing with fully compatible products from RYBS."

See the FAXNeT Form on Page #51

AT&T outage locks up user nets

continued from page 4

yet to determine how much business the company may have lost.

Chuck Garrison, director of telecommunications for the Chicago Board Options Exchange, said the event will damage AT&T's image. "I think Wall Street's confidence in AT&T has been shattered," he said. "Some people who staunchly demanded AT&T service because it's reliable will be coming back and saying, 'Give me an alternative.' "

Garrison said he is not satisfied with AT&T's explanation of the problem and questions why network technicians were not able to isolate the glitch before it spread. "Obviously, AT&T has a problem because they didn't recognize the [glitch] and shut down in an orderly manner; they crashed," he said.

Union Pacific Railroad Co. took immediate action to mitigate service disruption, which for seven hours knocked out its AT&T 800 lines and an Integrated Services Digital Network Basic Rate Interface link at its 300-agent national customer service center in St. Louis. On a typical day, the center handles about 16,000 incoming customer calls.

"We took a proactive approach and sent an electronic message over our private SNA net to all customer service and sales representatives explaining what had happened to the AT&T net," said James Merrick, assistant vice-president of telecommunications systems for Union Pacific.

Employees were instructed to contact accounts and ask them to call in on the railroad's US Sprint 800 numbers. Union Pacific's St. Louis site and its Omaha headquarters are linked via T-3 fiber trunks to AT&T, MCI Communications Corp. and US Sprint points of presence.

Like First Union, Union Pacific said it is too soon to tell how much business it may have lost as a result of the failure. "It's difficult to measure the impact of the event because it took place on a holiday," Merrick said. The railroad will ask AT&T for credits to cover lost time. "AT&T has cooperated [with discounts] in the past. I'm sure they will this time too," he said.

But some big AT&T accounts contacted last week were apathetic about the carrier's plan to offer customers a full business day of discounted long-distance calling. "That's just wonderful," one telecommunications manager said sarcastically.

Although Union Pacific said it has no plans to replace AT&T with a rival service provider, Merrick expects other users will do so. "This is going to cost AT&T a lot of money. Companies that don't already use multiple carriers will probably split their service between AT&T, and US Sprint or MCI."

Letters

continued from page 31

that if I don't plan for every possible failure, Murphy will gladly step in. I cite Murphy's Law almost daily, not as a way to pass off blame, but as justification for the thorough testing I perform. I will gladly "overdesign" or "overtest" a system if I feel it will thwart Murphy.

Let's not always consider Murphy's Law as a crutch used by incompetents.

Robert Bybee
Principal engineer
Telecorp Systems
Norcross, Ga.

Are You A Proving Ground For Your International Long Distance Company?

Why should your network be somebody else's learning experience?

At AT&T, we've been managing the largest international telecommunications network for more than 60 years. We have more direct links from the U.S. to overseas locations than anyone else, period.

So when we take on your company's private network we have the capabilities, knowledge and know-how to do the job right.

We'll work with you to recommend the right system or service to meet your needs. And whether it's managing basic transmission or designing a global digital network, the AT&T Worldwide Intelligent Network ensures that your application will run smoothly.

So call the AT&T International Response Center at 1 800 448-8600.

And work with a company that already has a wealth of experience, instead of one in search of it.

© 1989 AT&T

AT&T
The right choice.

Net staffers shift to serve users

continued from page 1

managers on fact-finding missions to discover end-user needs and objectives. They then report to planning and strategy groups, which determine how information technology can be used to enhance business operations.

Still others rely on less formal methods. They encourage network personnel to meet with users in other departments, such as purchasing, accounting, sales and manufacturing, to find out how they work. Armed with that knowledge, net personnel can help end users solve their problems or meet objectives through communications technology.

Last year, United Air Lines, Inc. decided its IS department wasn't close enough to end users, so it farmed out 10 people to other areas of the business. These application developers now report directly to managers who run such departments as flight operations, in-flight services and aircraft maintenance.

The end result, said David Nevers, senior telecommunications engineer at the airline, is that the company provides better support to end users and more quickly identifies technological solutions to business and operational problems. "The restructuring has forced our IS people to learn first-hand how the business operates," Nevers said. "This helps them design applications more in tune with user needs."

The one drawback is that technical people are now assigned tasks and evaluated by managers who may know little about IS and networking. This has made IS workers somewhat uncomfortable, Nevers said. But both groups — end users and IS staffers — think the benefits are worth the discomfort, he said.

A large consumer products company has taken the idea of reassigning technical workers one step further. The company recently decided to include IS experts in customer account teams that serve the company's largest clients. These teams are composed of sales reps, logistics analysts and other specialists.

"This puts MIS out on the front lines next to the competition, where they are more likely to develop business-driven solutions," said a senior network manager at the company who asked not to be named. "It also gives the company greater flexibility to respond to market changes or a new competitive threat."

Take a user to lunch

Rather than restructuring the organization, other companies rely on more informal methods of integrating business and technology goals.

The telecommunications department at Great-West Life Assurance Co. has adopted the slogan, "Take a user to lunch," to improve rapport and communications between end users and members of the department.

"We realized we were operating more from a reactionary mode than a proactive one when it came to meeting user needs," said William Trout, senior telecommunications specialist at the Englewood, Colo.-based firm.

The program has been so successful that the department even set up a pilot program last year to get its telephone operators to talk to end users. Receptionists now have a better feel for what goes on in different departments and how to direct calls, Trout said.

Technical managers who seek out and question end users about what they do can learn to apply technology to meet customer needs, instead of making customers adapt to the technology, said Nancy Austin, coauthor of *A Passion for Excellence: The Leadership Difference* and president of Nancy K. Austin, Inc., a management consulting firm in Capitola, Calif. Austin was a featured speaker at the International Communications Association's 16th Annual Winter Seminar last week in Fort Lauderdale, Fla.

"The opportunity is ripe for network executives to be better listeners," she said.

Austin said managers too often look for "blockbuster" systems that can give their company a competitive edge. Instead, network professionals should listen to internal and external customers, and take incremental steps to improve service.

Great-West has a network architecture and planning group whose main purpose is to "turn business plans into technology plans," Trout said. One person in the group works full time visiting users and finding out how their departments operate and what their future requirements might be. The entire group then sifts through this information and tries to devise applications to help departments improve customer service and efficiency.

So far, the group has spearheaded the implementation of a corporatewide voice-messaging system and a voice response system, which speeds the processing of customer phone inquiries, Trout said.

New York Life Insurance Co. uses a similar fact-finding approach. The company assigns senior IS managers to work as business analysts at the company's 12 major profit centers. The analysts, who are selected because they have strong technical knowledge plus good interpersonal skills, gather at the corporate headquarters once a month to brainstorm and develop strategy.

"We first discuss what we've learned in the field and business strategy. Then we put on our technology hats and try to determine what new technologies, development tools and network strategies we can apply and in what time frame," said Thomas Pettibone, vice-president of IS at the New York-based company.

Oracle bases net on Netrix switch

continued from page 2

tor of marketing for Oracle's Network Products Division.

Today, Oracle has two distinct networks that support only North American sites and the U.K., said John Martin, senior manager of integration services for the company. The first is based on statistical multiplexers, uses line speeds up to 56K bit/sec and supports communications between asynchronous devices and the corporate data center here.

Oracle's Gene Shklar

The other network, which has evolved gradually over the years, "is a giant bridged LAN that is not manageable and has grown in a patch-quilt way," Martin said.

That network only links LANs at sites within the U.S. and U.K., but the new backbone will support X.25 connections among LANs using routers supplied by either cisco Systems, Inc. or Wellfleet Communications, Inc., depending on the outcome of an evaluation currently under way.

That will be an important boost for the company, which relies heavily on electronic mail to conduct its business, Martin said. In the 18 months he's been with Oracle, Martin said a paper memo has yet to cross his desk.

"Oracle is a company that runs on E-mail," he said. "If you're not on E-mail in Oracle, you're not doing business. That's why this [network] is very important."

Oracle uses a distributed computing strategy, based on minicomputers and LANs from multiple vendors, as well as its own distributed data base software, Shklar said. That strategy gives each local site its own processing power for most applications.

Martin said four protocols will be routed via the X.25 backbone: Internet Protocol, Digital Equipment Corp.'s DECnet, Apple Computer, Inc.'s AppleTalk and Xerox Corp.'s Xerox Network Systems. The backbone will support circuit-switched file transfers from the LANs to corporate mainframes here and in London.

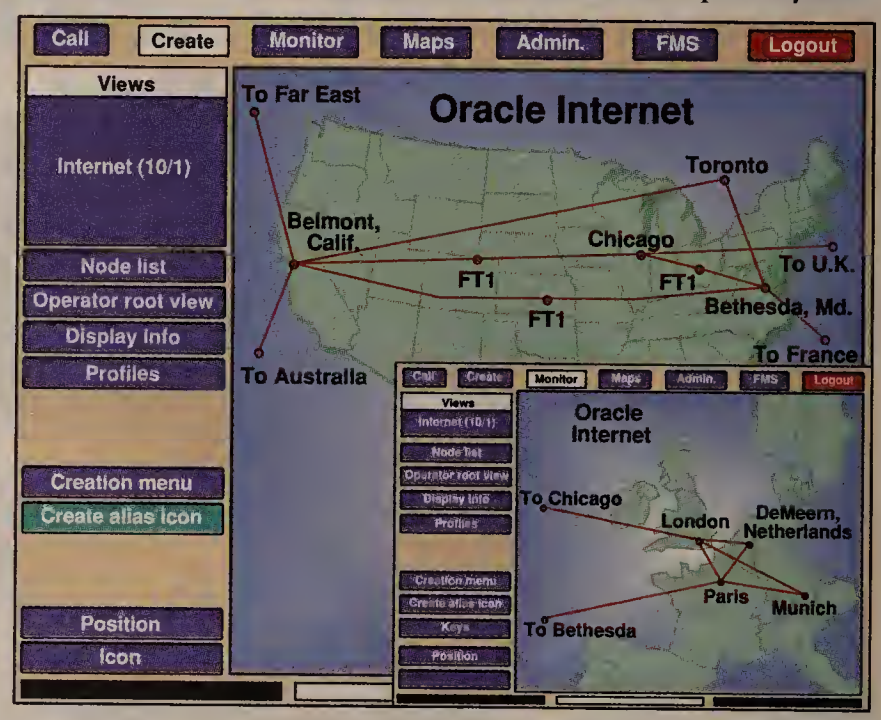
The backbone will also help Oracle eliminate multiple data lines that cover the same territory, contributing to the $120,000 per month in line costs the new network is expected to save Oracle in North America and the U.K., Martin said.

Part of that savings will come from the fractional T-1 links the company is installing, he said. Support for fractional T-1 was an important factor in the selection of the #1-ISS. Oracle headquarters here and sites in Bethesda, Md., Chicago and Toronto will be linked in a mesh design with fractional T-1 links supplied by AT&T, Martin said.

The service will cost about one-fifth of what the company now pays for digital data service links, which operate at only 56K bit/sec instead of the 64K bit/sec supplied under fractional T-1.

To support its international sites, Oracle plans fractional T-1 links to #1-ISS nodes in Paris and London via the Private Trans-Atlantic Telecommunications (PTAT) and Trans-Atlantic Telecommunications-8 (TAT-8) cables. Additional #1-ISS nodes will be installed in DeMeern, Netherlands, and Munich, West Germany. The London and Paris nodes will act as gateways to the Infonet public packet network, and all four nodes will act as hubs for lower speed lines feeding in from surrounding areas.

Infonet will also be used to reach sites in the Far East and Europe. Australia will be supported via a 56K bit/sec satellite link from both Belmont and London.



GRAPHIC BY SUSAN SLATER

SOURCE: ORACLE CORP., BELMONT, CALIF.

Net management screen showing Oracle's global network.

The company will also use some circuit-switched links, however, for applications such as file transfers to mainframes that perform better over circuit-switched links than packet-switched links.

Oracle opted for the Netrix #1-ISS in part because the product could support both circuit and packet switching. Vendors including Hughes Network Systems, Inc., Telematics International, Inc., Network Equipment Technologies, Inc. and Northern Telecom, Inc. offered to support both circuit and packet switching but not in the same switch, which made the Netrix switch more cost-effective, Martin said.

The heart of the #1-ISS is its Switching and Processing Modules (SPM), which combine a packet and circuit switch on one card. The #1-ISS has no central processor but instead relies on the combined power of the SPMs. That means users can install extra SPMs within a single switch to provide disaster recovery should one or more SPMs fail.

Users can alternate between packet- and circuit-switching mode through software changes in the switch's network management system. In this way, #1-ISS ports, for example, can be configured for circuit switching just long enough to complete a file transfer, then be converted back to X.25, Martin said.

> "Oracle is a company that runs on E-mail," Martin said. "If you're not on E-mail in Oracle, you're not doing business."
>
> ▲▲▲

That Netrix net management system, which is based on a Hewlett-Packard Co. Apollo Systems Division 3500 Series workstation, was another major reason Oracle opted for the #1-ISS.

"The entire network has to be able to be managed and monitored from a single site, and that site has to move around the world as the sun sets," Shklar said.

The Netrix net management system includes an easy-to-use graphical user interface.

Netrix uses graphics at virtually every level of detail, while other systems will show problems graphically but force users to enter text commands in order to fix them, he said. The Netrix system also lets users configure the network by drawing a graphical network representation on the Apollo from which routing tables are automatically generated. Other systems make users draw network representations and enter text-routing tables.

Times change. Are your LAN connections outgrowing your budget?

You've started tying company LANs into an integrated network only to face the overwhelming demands of other departments that want to connect. While you could inflate your budget buying more hardware each time you add another LAN, with the ACS 4400 there's no need. With up to eight serial ports, a single ACS 4400 grows with your network.

Eliminate extra hardware without compromising reliability.

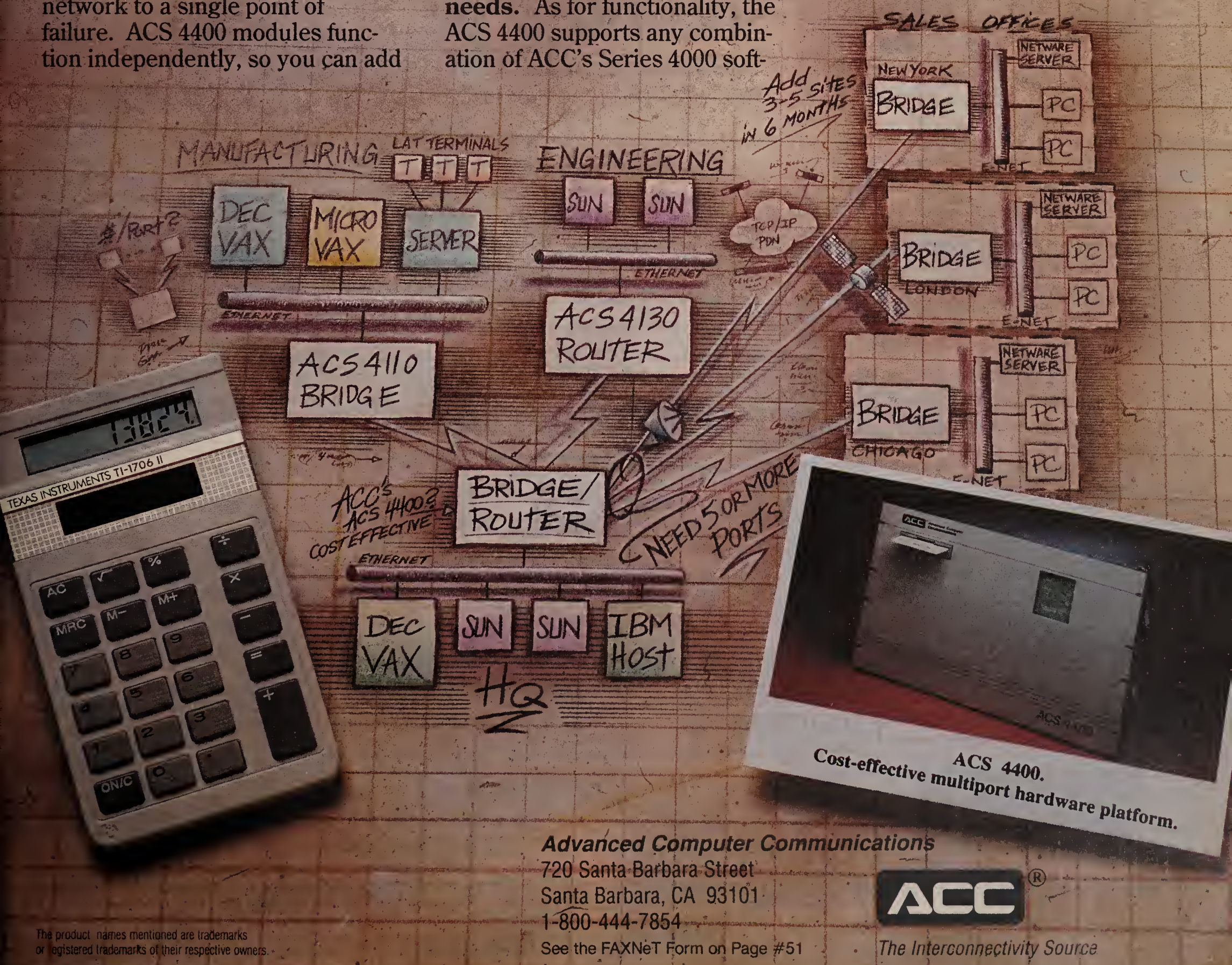
Cutting down on hardware doesn't mean reducing your network to a single point of failure. ACS 4400 modules function independently, so you can add or replace them individually without disabling the entire network.

Invest in the future by buying only what you need today.

While the ACS 4400 supports up to eight ports, you don't have to purchase them all at once. You can start with two or four and add more when new requirements arise. So while you spend only as much as your needs require, you also protect your investment by keeping expansion options open.

Tailor the ACS 4400 to fit your needs. As for functionality, the ACS 4400 supports any combination of ACC's Series 4000 software packages. Each ACS 4400 comes bundled with your choice of software. A single ACS 4400 supports bridging, routing, or combination bridge/routing all at the same time!

For additional information on the ACS 4400 and the entire ACS Series 4000 line of adaptable internetworking products, call ACC today at **1-800-444-7854.**



ACS 4400.
Cost-effective multiport hardware platform.

Advanced Computer Communications
720 Santa Barbara Street
Santa Barbara, CA 93101
1-800-444-7854

See the FAXNeT Form on Page #51

ACC®

The Interconnectivity Source

The product names mentioned are trademarks or registered trademarks of their respective owners.

HP to unveil network control package

continued from page 58

vices and a new version of OpenView Windows.

The OpenView Event Management Services module collects network management data from multivendor devices, and that data is used to update node status on the workstation screen.

The server software will initially collect data from devices that support the Simple Network Management Protocol, which is used to manage TCP/IP networks, and the Common Management Information Protocol over TCP/IP, which is an implementation of the Open Systems Interconnection's Common Management Information Protocol used to manage TCP/IP nets.

In the future, HP will add support for the protocols currently being defined by the OSI/Network Management Forum, a group of vendors devising a common implementation of OSI net management standards.

The OpenView Data Management Services module provides a common data base structure in which performance, configuration and alarm information about multivendor devices is stored.

Windowing

Lastly, the new version of OpenView Windows has two parts, one that runs on the server and one that runs on client workstations supporting the X/Window System or the Open Software Foundation's Motif. OpenView Windows retrieves data from the server and builds a graphical map of the network that displays icons representing network devices and data about those devices.

The OpenView Network Node Manager application, which runs on top of the OpenView Network Management Server, enables users to configure as well as detect and isolate faults in TCP/IP devices.

OpenView Network Node Manager includes a node discovery feature that automatically collects network address information from every node on a TCP/IP net, builds a node data base and draws a net map that is displayed on the workstation.

A single-user license for OpenView Network Management Server, which includes an application development tool kit, costs $25,000. The license fee for each client is $5,000. OpenView Network Node Manager software will be priced up to $15,000, depending on the HP 9000.

US Sprint set to unveil new bill service

continued from page 1

competitive weapon for US Sprint. It'll thrust them to the front of the long-distance market in terms of billing," said Robert Self, founder of Market Dynamics, Inc., a New York-based tariff analysis firm.

IPS will give US Sprint flexibility in designing new services and redesigning current offerings, Self said. "Services are basically permutations of billing systems." Nice Corp., an early user of the IPS data access feature, said the service has helped the company identify traffic trends at its 2,000-agent telemarketing service bureau in Ogden, Utah.

Nice uses an on-site personal computer emulating an IBM 3270 terminal to dial into IPS and access traffic data on a US Sprint IBM mainframe.

"IPS lets us analyze basic traffic data, including the number of calls answered and the number turned away, on an hourly basis, for our 600 US Sprint 800 lines. This information helps us identify traffic patterns and lets us staff accordingly," said Richard Clements, telecommunications manager and engineer for Nice.

The firm's agents field calls for companies that run television advertisements accompanied by an 800 number.

Nice, one of the nation's largest telemarketing service bureaus, began using IPS in November. "It has really worked quite well for us," Clements said. "We've had no problems with the system."

With IPS, Nice can view traffic data less than one day after it has been collected, he noted.

US Sprint's Smith said the carrier began cutting customers over to the new system about two months ago and it hopes to have all users migrated by the end of the year. The company declined to say how many customers have been cut over to date.

Through IPS, customers will receive a single bill covering all switched and dedicated services provided by US Sprint, as well as data services offered by Sprint Data Group, formerly known as Telenet Communications Corp.

Two-phase introduction

IPS is being introduced in two phases, according to Smith. In the first phase, US Sprint will provide the single bill and the management reports on any requested media, including magnetic tape, disk and paper.

The reports will accompany the bill or arrive up to three days later.

In the second phase, users will be given access to traffic data on IPS from an on-site terminal.

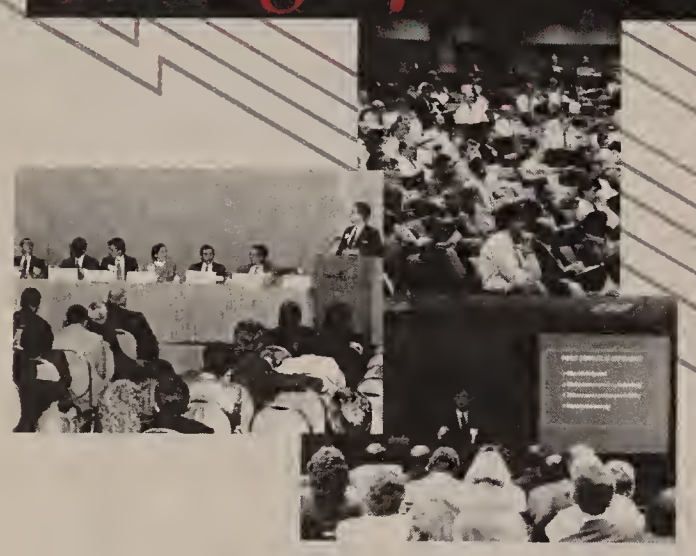
US Sprint would not say if it will charge users extra for the billing services. Analysts predicted the carrier will not charge for the single bill but might charge for any bill customization.

They also said IPS will be a base on which US Sprint can build a competitive edge.

"The new system will allow US Sprint to bring all services under one umbrella discount plan and automatically calculate the applicable discount, something AT&T and MCI can't do now," said Daniel Briere, president of TeleChoice, Inc., a Manchester, Conn.-based consultancy.

"This would give current US Sprint customers a major incentive to bring all their traffic to US Sprint," Briere said. Carriers can't offer this type of discount plan until they have the billing system to support it, he added.

Manage your network for success!



Announcing the 3rd Annual

NETWORK MANAGEMENT SOLUTIONS '90

Anaheim Hilton Hotel, Anaheim, CA
April 10-12, 1990

"You're only as good as your network!"

Like it or not, that's how your boss, your network users, and your competitors evaluate you as a network manager.

Come to NETWORK MANAGEMENT SOLUTIONS '90 for three information-packed days that will help you get more from your current voice/data network, and plan for the faster, more productive network in your future.

NETWORK MANAGEMENT SOLUTIONS '90 is an in-depth, hands-on immersion in the strategies and tactics, ideas and insights, technologies and solutions that will help you meet your networking challenges and solve your networking problems.

You'll choose from over 40 conferences, tutorials, and vendor demonstration suites to —

- Stay on the leading edge of new technologies in voice and data networks in the 1990s
- Make your current multivendor network more powerful, productive and efficient now
- Get the latest facts on network design, implementation, operation and control
- See the latest networking hardware and software products in action

NETWORK MANAGEMENT SOLUTIONS '90 is highly targeted to your needs. It's the best conference run with network managers exclusively *for* network managers.

Attending this conference will give you a chance to get answers to your specific network management questions, to rub elbows with the best and the brightest of your colleagues, and to make new professional contacts.

Three conference tracks allow you to customize your learning experience.

Wide-Area Network Management
- Trends in SNA Network Management
- Progress Report: OSI Network Management
- Progress Report: Integrated Network Management Solutions
- What's New in Network Design/Optimization Tools
- Pros and Cons: Turning the Network Management Responsibility Over to a Carrier or Systems Integrator
- Automated Network Management: Are We There Yet?
- Update: Carrier Supplied Network Management Tools
- Artificial Intelligence in Network Management

Local-Area Network Management
- Progress Report: LAN Management Standards
- LAN Design and Optimization Tools
- Integrating LAN Management with WAN Management Tools
- LAN Management Assessment
- MEGA-Multi LAN Management
- LAN Management in the OS/2 Environment

User Strategies
- Integrated Network Management User Panel
- SNA Network Management Strategies
- OSI Network Management Strategies
- LAN Management Strategies
- DECnet Management Strategies
- The Users View: What We Really Feel About Network Management

Learn from industry experts —

Gary Beach
Publisher, *NETWORK WORLD*
Jeremy Frank
Program Director, Enterprise Network Strategies, The Gartner Group
James Herman
Principal, Northeast Consulting Resources
Atul Kapoor
President, Kaptonix, Inc.
Jerry McDowell
President, McDowell Romero
L. David Passmore
Partner, Network Strategies
Ian Sugarboard
Director, Network Technologies, Northern Telecomm
Hubertus Vandervoort
Senior Telecommunications Consultant, Computer Task Group
Timothy Zerblec
Principal, Vertical Systems Group

Plus meet leading vendors in demonstration suites. Ask the tough questions, get the answers you need.

Top Industry Sponsor and Conference Manager

NETWORK MANAGEMENT SOLUTIONS is sponsored by *NETWORK WORLD*, the newsweekly of enterprise networking strategies, and managed by the IDG Conference Management Group, the producers of Communication Networks, the country's leading communications conference and exposition.

"This conference finally proves that network management is ... for real. [It] will keep accelerating and soon will be combined with all of information management."
— John King, Consultant

Send for more information!

Don't miss this important conference!
Send for more information now.
There is absolutely no obligation.

The dates are April 10-12, 1990.
The focus is on your network success.

To find out more about NETWORK MANAGEMENT SOLUTIONS '90, call toll-free 800-225-4698, or send in this coupon today.

NETWORK MANAGEMENT SOLUTIONS '90
Anaheim Hilton Hotel, Anaheim, CA
April 10-12, 1990

INFORMATION REQUEST

☐ **YES,** please send me more information about the tutorials, conferences and vendor suites at NETWORK MANAGEMENT SOLUTIONS '90, so I can manage my network for success.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Telephone (_____) _____ Fax (_____) _____

NWW 631

Return this coupon to NETWORK MANAGEMENT SOLUTIONS '90, Box 9107, 111 Speen Street, Framingham, MA 01701-9107, or fax to 508-872-8237.

See the FAXNeT Form on Page #51

Top Novell execs discuss strategy

continued from page 1

ware arena, they are outgrowing us, and they should be. From the day Novell opened its doors, we said we were in the software business.

Everything we did in hardware was just to sell more software, and we said we'd ultimately be out of the hardware business. You can't expect to make much money in hardware because there are too many people doing it, including 3Com.

3Com spends too much time worrying about us when they ought to be worrying about how they'll compete with Compaq [Computer Corp.] and Hewlett-Packard [Co.] in the systems arena.

We've never felt that 3Com was a competitor except at the software level.

Actually, we love 3Com, and we hope they'll sell some of our products.

We sold quite a few of 3Com's products, including Ethernet adapters, and we were their largest reseller for a long time.

What's Novell's biggest weakness?

Miller: Service and support. The fact that we're the biggest network operating system supplier means that our service resources have been stretched pretty thin. But we are taking steps to bolster customer and dealer support.

We're adding more service and support people within our organization, plus we've added a 24-hour hotline service. This is especially important to users and dealers who are working with the technically more complicated NetWare 386.

We're also establishing training sessions for dealers and distributors so they can more effectively service customers.

What's on your agenda for NetWare in the '90s?

Bills: We intend to ensure that NetWare will remain *the* server platform in the '90s. IBM will absolutely dominate the host environment, Microsoft will dominate the desktop environment, and we will dominate the servers.

NetWare shines in the areas of transaction processing, communications I/O, system fault tolerance and real-time processing. Another key feature that will determine NetWare's success as the server platform of choice is that on a NetWare LAN, users of different cultures — DOS, Macintosh, Unix — can get to files transparently.

A Unix user can get to a file on a NetWare server, and it looks like a Unix file.

By contrast, in the OS/2 or LAN Manager environment, they cannot share the same file. An eight-character DOS file won't be recognized by OS/2, and a 256-character OS/2 file won't be recognized by a DOS machine.

What's the status of Named Pipes for DOS? There are rumors that it's already done and rumors that have you abandoning it altogether. What's true?

Miller: The truth is we started working on it two years ago and put it on the back burner for lack of demand. In the past two years, we've only had two major users request Named Pipes for DOS.

What we've been concentrating on instead is global naming services, TCP/IP support and increasing our Apple Macintosh connectivity.

I'm not ruling out the possibility of doing Named Pipes for DOS, but we're not going to do it unless or until we see significant user demand.

Will you deliver Server Message Block (SMB) support?

Bills: There will be third parties that create SMB support for our products, and we'll give them the tools they need to make it happen.

One reason [for Novell] to support SMB would be if DOS connectivity were SMB-standard, and that isn't true.

Another reason would be if IBM said that SMB is a standard, but they haven't. IBM says that LU 6.2 is the standard, and NetWare supports LU 6.2.

What's next after NetWare 386?

Noorda: Long-term, NetWare 586, and we're looking at the [Reduced Instruction Set Computer] market.

> We intend to ensure that NetWare will remain *the* server platform in the '90s. IBM will dominate the host environment, Microsoft will dominate the desktop, and we will dominate the servers.
>
> ▲▲▲

Short term, we're concentrating on enhancements to NetWare 386, as well as introducing more NetWare Loadable Modules (NLM) [see "NetWare to get global name service, other new features," page 4].

What's the difference between Novell's approach to networking and the strategy of your chief competitors — Microsoft Corp. and 3Com Corp.?

Noorda: They operate very differently from us. They force their OEM customers to pay an up-front licensing fee. Once the OEMs make the substantial monetary commitment, they have to back it up by selling products to recoup their investment.

Our OEMs don't pay up-front fees; Novell works with them to develop the products.

Over the years, we've had as many as 60 OEMs, and we currently have about 33; it's a fluid number. We don't force our OEMs to do a lot of work. We develop NetWare, help them port it into their environment and do most of the design work ourselves. Microsoft does practically none once they've sold the OEM agreement.

The main reason 36 OEMs are supporting LAN Manager is that there's an apparent endorsement by IBM of Microsoft's products.

The reason Compaq and others have signed on is that, in order to compete in the IBM environment, people have to say they'll support the same level of products.

Microsoft capitalizes very strongly on its association with IBM. The end user, by and large, is still in a quandry trying to decide whether to choose LAN Manager or NetWare, but the OEMs have to hedge their bets.

As Novell heads into the '90s, how will it help users decide to choose NetWare over rival network operating systems?

Noorda: Our strategy is simple and straightforward: to deliver better and more reliable products. We're just going to stay the course.

It comes down to better technology, aggressive and smart marketing, and things that are consistent with Novell's mission statement — that is, to accelerate the growth of the distributed processing segment of the information management system industry.

Far from being a big threat, we feel that LAN Manager can't help but grow the market. The challenge is to get more and more distributed processing.

We have Portable NetWare and NetWare 386, and we made sure we supported everything at the desktop: DOS, OS/2 Macintosh [and] Unix.

LAN Manager's primary focus is to support OS/2, and OS/2 by itself isn't the easiest thing to sell. It's expensive, it's taken a long time to get to market, and users aren't sure they really need it.

The LAN Manager camp has a one-world direction. Novell, on the other hand, is committed to supporting DOS, OS/2, Unix and Macintosh at the desktop.

We'll do whatever it takes to grow the LAN market. We'll buy and sell products from 3Com [and] we'll help them and Microsoft with their technology if they'll let us.

Have you ever approached either of these two companies with this offer?

Noorda: As far back as 1983, we went to 3Com with the offer to help them design their network operating system. In exchange, we hoped they'd pick up some of our parts.

I visited Bob Metcalfe [3Com's vice-chairman] at the 3Com booth at the [National Computer Conference] trade show in '83. I said Novell would like to help 3Com sell more adapters, and we'd like to port NetWare onto

Novell's Raymond Noorda

their systems. He asked me to leave the booth, saying we were competitors and shouldn't be doing business together.

We wanted to forge links to 3Com's EtherShare. We kept going back to see them at their Santa Clara [Calif.] headquarters in 1984, '85 and '86.

We never did receive any convincing rationale about why they didn't want to do business with us.

Now 3Com is in the news saying they're going to establish connectivity between 3+Open LAN Manager and NetWare.

Noorda: Yes, both Darrell Miller and Kanwal Rehki are now talking to 3Com. I don't care who takes the credit for it; I only care that it gets done. In fact, we're giving them a lot of help on that score; our engineers are working with their engineers to help them get it right.

What's your position on the Microsoft/Ashton-Tate Corp./Sybase, Inc. SQL Server?

Bills: Somehow people have been led to believe that for SQL Server to work, you have to have LAN Manager because Sybase is SQL.

Sybase is one supplier of an SQL engine; SQL is the point as far as data base standards. And the SQL engine that performs the best will be the one that wins.

For Sybase to win, they'll have to meet their competition; if their competiton writes to an NLM, you'd better believe that Sybase will write a NetWare NLM to get users' business.

There is a rumor making the rounds that Novell and Sybase are working on an NLM version of SQL Server. True or false?

Noorda: We are having discussions with them and other data base vendors, but we can't comment on specific discussions.

Bills: We're talking with everybody. It's very easy to write an SQL data base as a NetWare NLM. At Comdex/Fall '89, we had at least a dozen NLM developers, and what they said was it took them a year or longer to port an SQL data base to OS/2, compared with just weeks to port to NetWare.

We can't determine when the product/application will be developed. All we can do is make sure that it's easy for them to write an SQL data base as a NetWare NLM.

Still, for whatever reason, your data base message isn't getting out to the industry in any cohesive fashion.

Bills: You're right, and the reason for that is that the press and analyst community is overwhelmed by the perceived partnership of Microsoft and IBM.

What's Novell's strategy in terms of competing against IBM?

Bills: We don't view IBM as a rival. We do more to help IBM sell equipment than any vendor in the LAN industry.

In the IBM connectivity arena, we provide a multitude of services. In 1989, we sold more SNA gateways than any other company — about 4,000. In 1990, we'll at least triple SNA sales to Fortune 100 users.

We have management tools that enable users to manage host sessions, and at the [Application Program Interface] level, we support IBM standards. Any IBM user can use Novell NetWare to solve problems now and still maintain their IBM strategic compatibility.

Noorda: Another thing most people aren't aware of is that IBM is one of Novell's largest customers. IBM buys NetWare from us to sell along with its Token-Ring LANs to its customers in the K-through-12 education market.

What's your growth forecast this year? Do you anticipate any slowdown in demand for NetWare? Will you effect any cost cutting measures?

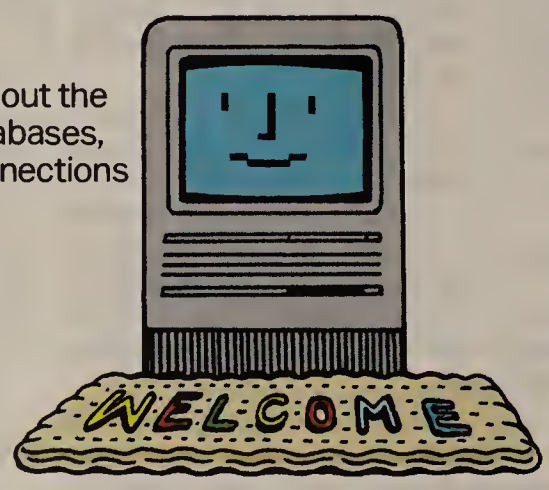
Miller: We're forecasting 20% growth this year, which is very healthy and manageable. We don't anticipate any extraordinary cost-cutting measures, although we're constantly looking for ways to trim unneeded expenses.

We're still doing selective hires, especially in our engineering and service support organizations, and we're not planning any hiring freezes or layoffs.

What to do with Timbuktu.

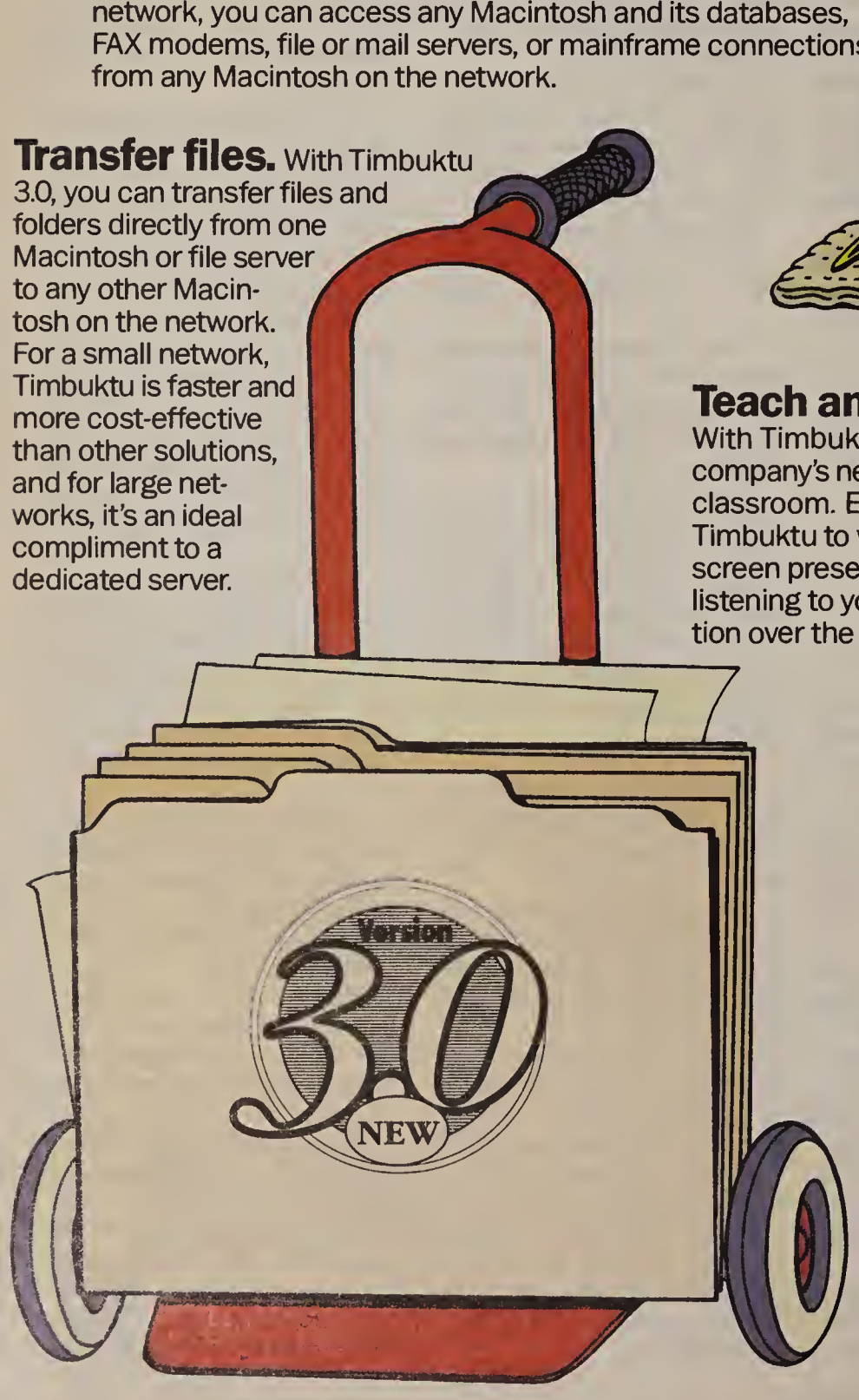
Share screens.
With Timbuktu on every Macintosh, you can invite others to share your point of view. (Advanced password protection ensures privacy.) Sharing screens allows two or more users to work on any document simultaneously. It also allows user support people to help solve users' problems without leaving their desks. Combine Timbuktu with Farallon's network management software, and support people can manage computers and servers from anywhere on the network. Timbuktu/Remote functions similarly to Timbuktu, only over modems or ISDN links.

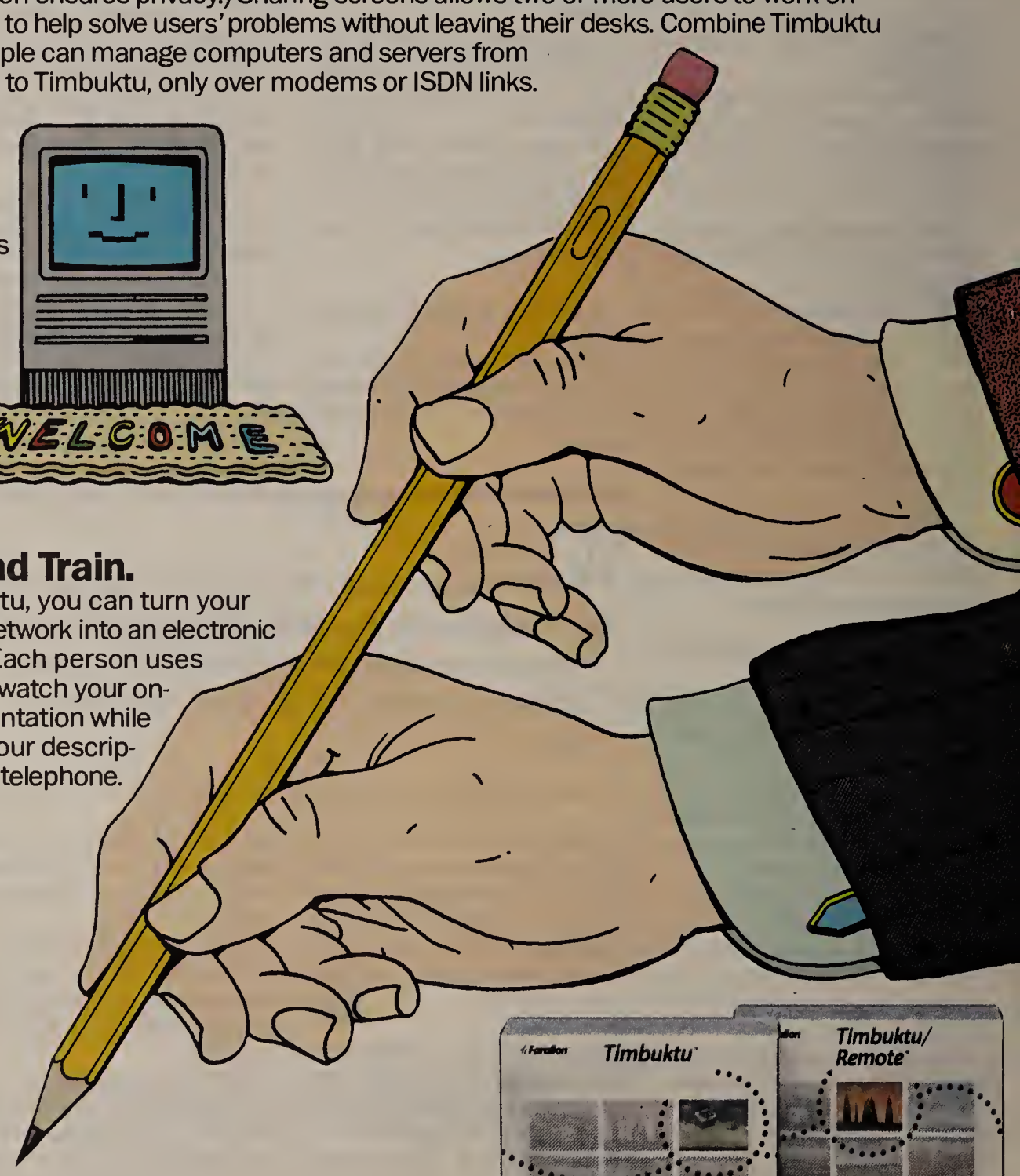
Share resources.
With Timbuktu installed on each Macintosh throughout the network, you can access any Macintosh and its databases, FAX modems, file or mail servers, or mainframe connections from any Macintosh on the network.

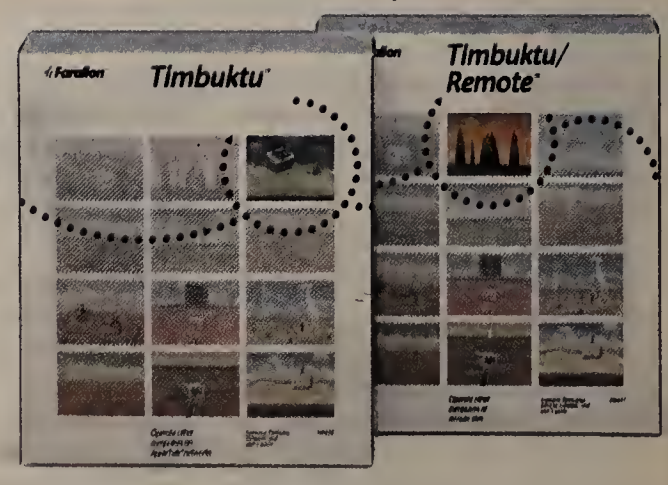


Transfer files. With Timbuktu 3.0, you can transfer files and folders directly from one Macintosh or file server to any other Macintosh on the network. For a small network, Timbuktu is faster and more cost-effective than other solutions, and for large networks, it's an ideal compliment to a dedicated server.

Teach and Train.
With Timbuktu, you can turn your company's network into an electronic classroom. Each person uses Timbuktu to watch your on-screen presentation while listening to your description over the telephone.







Farallon™

For tech support call, (415) 596-9000.

ONE TIMBUKTU PACKAGE IS REQUIRED FOR EACH MACINTOSH.
FAX: (415) 596-9020. Timbuktu is a trademark of Farallon Computing, Inc. Macintosh is a registered trademark of Apple Computer, Inc.
© 1989 Farallon Computing

See the FAXNeT Form on Page #51